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NATIONAL DAM INSPECTION PROGRAM. NDS I.D. NUMBER PA-00174. DER --ETC(U)
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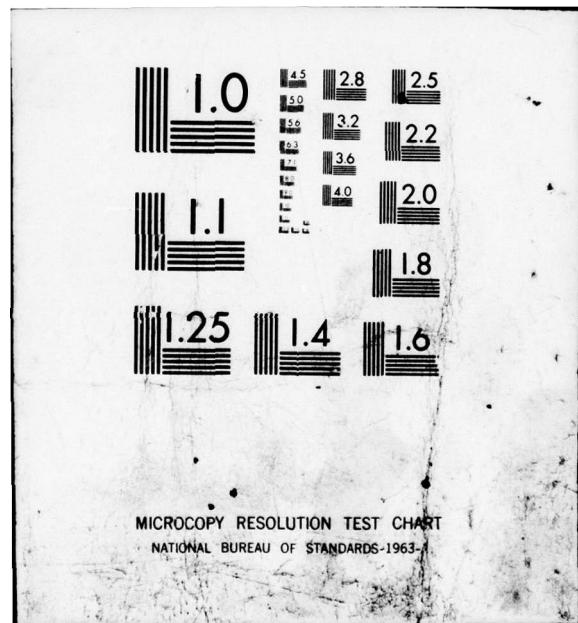
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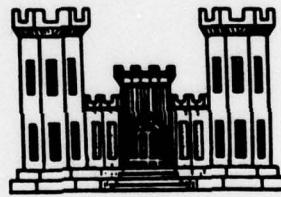
DELAWARE RIVER BASIN

GREENE DREHER DAM
WAYNE COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NDS I.D. Number PA-00174.
DER I.D. Number 64-174.
Delaware River Basin, Greene Dreher
Dam, Wayne County, Pennsylvania.
Phase I Inspection Report.



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(15) DACW31-79-C-0017
Submitted to:

DEPARTMENT OF THE ARMY
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Baltimore, Maryland 21203

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PREFACE

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This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Greene-Dreher Dam
County Located:	Wayne
State Located:	Pennsylvania
Stream:	Manny Run
Coordinates:	Latitude 41° 15.1' Longitude 75° 21.8'
Date of Inspection:	25 October 1978

Greene-Dreher Dam is owned by the Wayne Commissioners and maintained by the County. The dam and reservoir are used as a flood control structure along the Manny Creek watershed, which affects residents who live near Manny Run at the intersection of Routes 423 and 191, approximately 3/4 of a mile south of South Sterling, Pennsylvania. The impoundment was designed by the United States Department of Agriculture, Soil Conservation Service, in 1960, and the structure was officially completed in 1964.

The dam and its appurtenant facilities are considered to be in good condition and well maintained. The dam is classified as a "Small" size dam with a "High" hazard potential consistent with its potential in the event of failure for extensive property damage and the possibility of the loss of a few lives along Manny Run just south of South Sterling, Pennsylvania.

Calculations indicate that the existing spillway systems are capable of passing the Probable Maximum Flood without overtopping. Therefore, the spillway system is considered to be "Adequate".

The visual inspection and review of available documentation indicates that the dam, foundation and its appurtenant structures are in good condition and the embankment materials were placed in accordance with specification requirements. However, a few items of concern which can be corrected during normal maintenance operations were noted. These recommendations are presented in order of priority.

1. The swale at the right abutment should be filled with compacted soil to at least the same elevation as the dam.
2. The missing trash rack pipe on the intake riser should be replaced.

3. All of the woody vegetation growing on the downstream embankment slopes should be cleared during the normal maintenance program.
4. The riprapped discharge channel of the principal spillway should be inspected after each severe storm and, if scour or undermining of the spillway pipe begins to develop, the channel should be rehabilitated.
5. Since the only prepared access route to the dam is through the emergency spillway, an alternate route should be established to allow the monitoring of the structure during periods of high inflow from storm runoff.

Because of the location of the dam upstream from a few houses and businesses, a formal procedure of observation and warning during periods of high precipitation and subsequent runoff should be developed and implemented. This procedure should include a method of warning downstream residents and businesses of the possibility of flooding. The Owner should also develop an operation and maintenance checklist similar to the checklist completed by the Soil Conservation Service during their routine inspections. The checklist should be used during routine inspections to insure that the dam is operated in a safe manner and maintained in the best possible condition.

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6 March 79
Date

WS Gardner
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3/6/79
Date

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APPROVED BY:

G. K. Withers
G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

28 Mar 79
Date

OVERVIEW
GREENE DREHER DAM, WAYNE COUNTY, PENNSYLVANIA

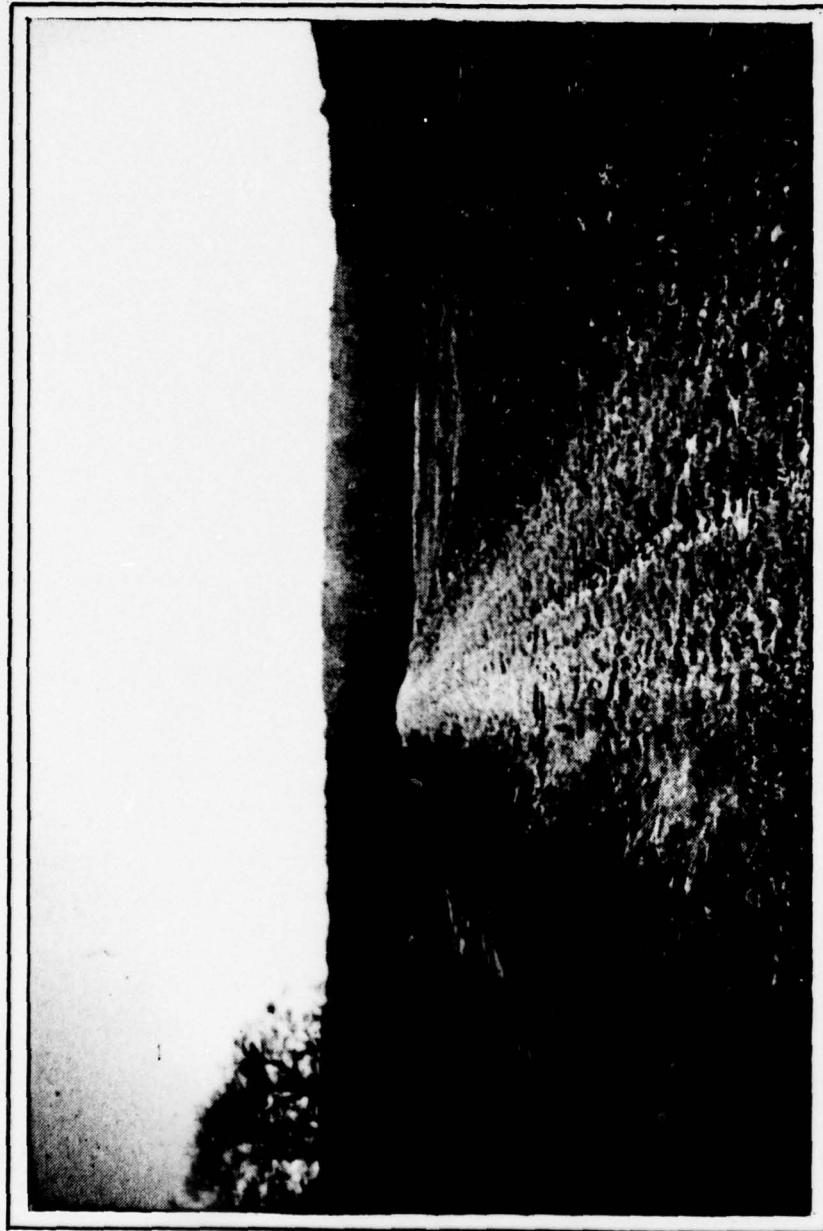


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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
GREENE-DREHER DAM
(SCS Dam PA 447)
NATIONAL ID #PA 00174
DER #64-174

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Greene-Dreher Dam is a 20-foot high earthen embankment, 1,000 feet long which impounds a 152 acre-foot flood water retention pool. Total estimated volume of fill is approximately 30,000 cubic yards.

The zoned embankment was constructed on natural soils without a cutoff trench or a grout curtain. As shown on Plate 3, the embankment contains three material zones; Zone 1, a relatively impervious core of silt and silty sand; Zone 2, composed of silty gravel and silty sand; and an outer shell of Zone 3 material, described as rock larger than 6 inches in diameter. The embankment crest is 12 feet wide at a design settled elevation of 2,036 feet, and both upstream and downstream slopes are 3H:1V. As shown on Plate 5, the downstream section of the embankment contains a filter blanket approximately 2 feet thick, 30 feet wide and 320 feet long. The filter blanket is drained by a 6-inch diameter perforated corrugated metal pipe connected to a 6-inch diameter pipe which outlets adjacent to the principal spillway outlet.

Water is normally discharged through the principal spillway. A drop inlet riser is located at the upstream toe of the embankment at approximately Station 19 + 56, as shown on Plate 2. Water overflows the riser weir at elevation 2,024.0 or through a low stage inlet at elevation 2,019.5, and

discharges through a 24-inch diameter reinforced concrete pipe. This conduit discharges into a plunge pool at the downstream toe at elevation 2,014.7. The riser also contains a gated pond drain at elevation 2,016.5, which discharges through the 24-inch ID reinforced concrete pipe. The Armco sluice gate is 12 inches in diameter. The concrete discharge pipe located at the base of the dam is founded on natural ground. It is approximately 129 feet long and has three anti-seepage collars.

During severe storms, excess water is discharged over the emergency spillway at the left abutment. The grass-lined emergency spillway is approximately 100 feet wide with a 20-foot level control section at elevation 2,031.5. The channel discharges into the downstream valley.

b. Location. The dam is located on Manny Run in Tobyhanna State Park near Route 196 in Dreher Township, Wayne County, Pennsylvania. The dam site and reservoir are shown on USGS Quadrangle entitled "Newfoundland, Pennsylvania" at coordinates N 41° 15.1' W 75° 21.8'. A regional location plan of Greene-Dreher Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as "Small" by virtue of its 196 acre-foot maximum storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life downstream near the intersection of Manny Run with Routes 423 and 191, approximately 3/4 of a mile south of South Sterling, Pennsylvania.

e. Ownership. Greene-Dreher Dam is owned by the Wayne County Commissioners and maintained by county representatives. All correspondence should be sent to Mr. Richard Simpson, Wayne County Commissioners, Court House, Court Street, Honesdale, Pennsylvania 18431.

f. Purpose of the Dam. Flood Control.

g. Design and Construction History. The application to construct the dam and the "Report Upon the Application of the Commissioners of Wayne County" was submitted on 4 May 1960. The permit to construct the dam was issued by the State of Pennsylvania on 8 June 1960. Clearing and grubbing began in the Fall of 1960 but actual fill operations did not begin until July 1961. By August 1961 the construction was 60 percent complete, and by October 1961 it was 92 percent complete. The final field inspection by the County Commissioners and SCS was performed by 12 December 1961, but the

final inspection by the Department of Environmental Resources (DER) was delayed until 23 October 1964. At this time all appurtenant structures were completed, including the grassing of the slopes.

The dam was designed by the United States Department of Agriculture, Soil Conservation Service (SCS) in 1960. The contractor was the C & S Excavation Company. Records in the Pennsylvania DER files indicate that the dam and its appurtenances were constructed in accordance with the specifications and drawings prepared by the SCS.

h. Normal Operating Procedures. Reservoir outflow is controlled by the principal and emergency spillways. Under normal conditions, the reservoir is dry. In the event of rain, runoff flows over the intake riser weirs, through a 24-inch diameter reinforced concrete pipe located at the base of the embankment, and discharges into a plunge pool at the downstream toe. The outlet invert of the pipe is at elevation 2,014.7. There are no minimum discharge requirements for this structure.

Excess water is stored up to elevation 2,031.5. Thereafter, water is discharged through the emergency spillway located at the left abutment.

1.3 Pertinent Data.

A summary of pertinent data for Greene-Dreher Dam is presented as follows:

a.	Drainage Area (sq miles)	0.37
b.	Discharge at Dam Site (cfs)	
	Maximum Known Discharge	Unknown
	At Emergency Spillway Crest	50
	At Design High Water	940
	At Top of Dam	2,740
c.	Elevations (feet)	
	Top of Dam	2,036.0
	Swale in Right Abutment	2,035.0
	Emergency Spillway Crest	2,031.5
	Principal Spillway Weir Crest	2,024.0
	Low Stage Inlet	2,019.5
	Pond Drain	2,016.5
	Design High Water	2,033.8

d.	Reservoir (feet)	
	Length at Normal Pool	600
	Fetch of Normal Pool	600
e.	Storage (incremental; acre-feet)	
	Sediment (to elev 2,019.5)	4
	To Riser Crest	30
	To Emergency Spillway Crest	114
	To Top of Dam	196
f.	Reservoir Surface Area (acres)	
	Normal Pool	4
g.	Dam Data	
	Type	Zoned earth/rock with D/S drainage blanket.
	Volume	30,000 cu yd
	Length	1,000± ft
	Height (maximum)	20± ft
	Top Width	12 ft
	Side Slope - Upstream	3:1 (H:V)
	- Downstream	3:1 (H:V)
	Cutoff	None
	Grout Curtain	None
h.	Principal Spillway	
	Type	2 ft x 6 ft x 10.5 ft concrete drop inlet riser discharging through a 24-in concrete pipe to a plunge pool.
i.	Emergency Spillway	
	Type	Grass-lined trapezoidal channel cut through natural soils.
	Crest Elevation	2,031.5
	Width	100 ft
	Length	350± ft
j.	Downstream Channel	The channel flows through a narrow wooded flood plain before joining Taylor Creek, about 1.4 miles below the dam.

SECTION 2
ENGINEERING DATA

2.1 Design.

A summary of engineering data for Greene-Dreher Dam is presented in the checklist attached as Appendix A. Principal documents containing pertinent data used for this report include the "Report Upon the Application of the Commissioners of Wayne County" by the Department of Environmental Resources (DER), dated 4 May 1960, and the "Permit" prepared by the Commonwealth of Pennsylvania, DER, dated 8 June 1960. Also included in the available documents was a nine-page set of drawings prepared by the U.S. Department of Agriculture, Soil Conservation Service (SCS), Site PA-447, dated 1960, as well as miscellaneous letters, correspondence, memos, including six black-and-white construction photographs by the DER.

The available data was sufficiently comprehensive to facilitate a Phase I inspection of the dam and appurtenant structures.

b. Design Features. The principal features of Greene-Dreher Dam are illustrated on Plates 2 through 6 and Appendix E. A detailed discussion of the design features of the dam and appurtenances is presented in Section 1.2, paragraph a; and a summary of pertinent data relative to the dam is presented in Section 1.3.

2.2 Construction.

A description of the available construction history is presented in Section 1.2, paragraph g. The constructor was the C & S Excavation Company, and the SCS designed the structure and provided construction inspection.

2.3 Operation Data.

Since the dam was designed as a flood control structure and to be operated without the use of a dam tender, there are no operational records maintained for this structure. To the knowledge of representatives of the Wayne County Commissioners, the emergency spillway has never been used.

2.4 Evaluation.

a. Availability. All engineering data reproduced in this report and studied for this investigation were provided by the DER, SCS, and from conversations with representatives of the Wayne County Commissioners.

b. Adequacy. There was no design data available. However, the drawings prepared by the SCS, coupled with the field inspection and other information provided by the DER and Wayne County Commissioners, was sufficient to evaluate the dam and appurtenant facilities.

c. Validity. There is no reason to question the validity of the data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B. The data is summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam and its appurtenances were properly constructed, are well maintained and in good condition.

b. Dam. During the inspection, there was no evidence found of surface cracks, unusual movements or cracking at or beyond the toe. The slopes were inspected and no signs of sloughing or erosion of the embankment and abutment slopes were found. There is minor trailbike damage to the crest of the dam, but this does not affect the flood storage capacity or the integrity of the structure. The riprap was inspected and observed to be in good condition. A few small evergreen trees were noted to be growing between the rocks on the embankment slopes. Some of the woody vegetation on the upstream slope has recently been cut. There was no noticeable seepage observed through or beyond the toe, but the reservoir was essentially dry and not under a hydrostatic head. The drain pipe, which discharges from the blanket drain, was carefully inspected and observed to be in good condition. There was a very slight amount of clear water discharging from the end of the pipe.

No unusual vertical or horizontal misalignments were observed along the crest of the dam to indicate a potentially unstable condition. However, the survey of the crest profile disclosed that the embankment crest is approximately one foot higher than the right abutment at the intersection of the embankment with the abutment. Thus, a swale is formed which would permit water to flow around the right end of the embankment before overtopping the embankment.

c. Appurtenant Structures.

1. Principal Spillway. There was no cracking or significant spalling observed on the intake riser. The discharge conduit could not be inspected, but the exposed portions of the riser and the conduit were carefully inspected and observed to be in good condition. One trash rack pipe was missing on the right side of the intake riser, which can be seen in Photograph No. 2. The rock-lined outlet channel, as

shown on Photograph No. 4, was observed to be stable and in good condition. The pond drain gate could not be exercised as it was locked and a key was not available from the County representative.

2. Emergency Spillway. The approach and discharge channels were both stable and well vegetated, being excavated into erosion-resistant materials and grass-lined. The side slopes were also well vegetated. The control section was checked with instruments and found to be of the dimensions and elevations shown on the Soil Conservation Service (SCS) drawings; see Plate 2, Appendix E. In summary, there were no signs of significant erosion, channel deterioration, or other evidence that would indicate that the spillway would not function as designed.

d. Reservoir. Although the reservoir is relatively small, there was no evidence of significant siltation, slope instability, or other features that would significantly affect the flood storage capacity of the reservoir. The surrounding drainage basin was inspected and observed to be quite stable, densely vegetated with trees and a dense growth of underbrush.

e. Downstream Channel. The downstream channel was inspected from the dam to Route 196 and found to be unobstructed and quite stable. Between Route 196 and the junction of Manny Run with Routes 423 and 191, the creek was not inspected in that it passed through a dense wooded area which was not reasonably accessible. However, the creek was inspected at the damage center (intersection of Manny Run and Route 423) and the banks were found to be stable. A view of the bridge at the damage center is shown on Photograph No. 8. The houses that would be affected by high flows are shown on Photograph No. 10.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal or emergency spillways. All appurtenant structures inspected, which include the principal riser, plunge pool and emergency spillway, were observed to be in quite good condition. A one foot deep swale was noted in the right abutment of the dam which would be the initial point of overtopping. The consequences of this condition are discussed in subsequent sections.

The only access to the dam is via an unpaved road leading through the emergency spillway which would prevent access to the dam in the event the spillway is in use. It is also noted that the structure was inspected when the reservoir was essentially dry. Therefore, the internal drainage systems were not inspected while under a significant hydrostatic head.

It is recommended that the dam be monitored closely for any signs of distress or potential failure. If any significant cracks or other damage are observed, the dam should be closed immediately and a detailed inspection conducted. If the dam is found to be in imminent danger, it should be evacuated and emergency measures taken to stabilize the structure. It is also recommended that the dam be monitored for any signs of distress or potential failure. If any significant cracks or other damage are observed, the dam should be closed immediately and a detailed inspection conducted. If the dam is found to be in imminent danger, it should be evacuated and emergency measures taken to stabilize the structure.

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SECTION 4 OPERATION PROCEDURES

4.1 Procedures.

Operational procedures are discussed in some detail in Section 1.2. The operation of the dam does not require a dam tender. Under normal conditions, flow discharges through the principal spillway entering at elevations 2,019.5 and 2,024.0. Thereafter, excess water is stored up to the emergency spillway crest (elevation 2,031.5). As reported by the Owner's representatives, water has never flowed over the emergency spillway. The dam is not monitored during periods of high precipitation and correspondingly high runoff. The reservoir can be drawn down or drained by opening the sluice gate at the base of the intake riser. The sluice gate valve is located at the top of the riser. There are no formal written operation or maintenance procedures other than a general maintenance procedure supplied by the Wayne County Commissioners through the Civil Defense Authority. However, the Soil Conservation Service inspects the structure for the first three years and submits their reports to appropriate authorities.

4.2 Maintenance of the Dam.

The dam is maintained by the Wayne County maintenance staff who periodically check the embankment, remove woody vegetation from the slopes, mow the grass, and perform other minor repairs and maintenance functions.

4.3 Maintenance of Operating Facilities.

The pond drain is usually lubricated and painted, if necessary, during a periodic inspection by Wayne County employees. Vandalism has recently required a lot of repairs to the principal spillway intake system.

4.4 Warning Systems In Effect.

The representative for the Wayne County Commissioners reported that there are no formal warning systems or procedures established to be followed during periods of heavy rainfall. If hazardous conditions develop or if high flow

conditions are anticipated, the local Civil Defense Authority would be notified by the Wayne County Commissioners.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facility at Greene-Dreher Dam.

Since there are no formal warning procedures, it is recommended that a formal procedure be developed so downstream residents may be amply warned of possible high flows or potentially hazardous conditions. Operational procedures should also be formalized. A maintenance procedure and inspection checklist similar to SCS criteria should be implemented and used.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Original design data could not be located, but the graphical flood routings were located in the State files with all of the necessary parameters to develop the inflow hydrograph. Site PA 447 was one of seven dams originally proposed for the 30.71 square mile Greene-Dreher watershed. Subsequently, two were dropped. Site PA 447 watershed is small, triangular shaped, approximately 0.37 square miles, approximately 0.95 miles long and 0.8 miles wide at the widest point. Elevations range from 2,229.0 at the upper reaches to 2,019.5 feet at normal pool level. The watershed is almost entirely wooded with little residential development at the upper end. As a portion of the watershed is within Tobyhanna State Park, the residential development is expected to be limited.

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard potential classification is 0.5 to 1.0 PMF (Probable Maximum Flood). The Soil Conservation Service (SCS) designed this dam as a Class C structure which requires the dam to be capable of passing the PMF.

b. Experience Data. There are no records of reservoir water levels or rainfalls within this watershed. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of the inspection, there were no conditions observed that would indicate that the outlet capacity would be reduced during a flood occurrence. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix B.

d. Overtopping Potential. Since the dam was designed to pass the PMF without overtopping, calculations checking this design PMF flood routing are presented in Appendix C. Hydrograph parameters developed as a result of this investigation differ from those used in the SCS design calculations. Current USGS Quadrangle maps indicate a drainage area of 0.37 square miles instead of the 0.55 square miles used by SCS designers. Also, the "Soil Survey of Wayne County" indicates all hydrologic Class C soils which, when combined with the land use, lead to a runoff curve number of 70 instead of the 62

used by SCS. This runoff curve number is used to estimate the amount of runoff from a given rainfall. The higher the curve number, the greater the percentage of runoff. The differences in the parameters are compensating so that the peak inflow rate was checked by using the HEC-1, Rev., computer program.

e. Spillway Adequacy. The original PMF inflow hydrograph is adequate, with a peak inflow value of 2,740 cfs. The resulting maximum reservoir level is 2,035.5 (shown on sheet 10 of Appendix C), which is 0.5 feet below the top of the dam and about 0.5 feet higher than the swale at the right abutment (see Section 3.1). The minimum recommended spillway design flood is 0.5 PMF, or about 1,300 cfs, which would result in a maximum reservoir level of less than 2,034 (by inspection of sheet 10 of Appendix C), well below the swale. Therefore, the spillways are rated as "Adequate".

f. Downstream Conditions. About 700 feet downstream of the dam, Manny Run passes under PA State Route 196 and 6,300 feet further downstream, under PA State Route 423. About 500 feet further, Manny Run joins Taylor Creek, and then into Wallenpaupack Creek.

At the intersection of Manny Run and Route 423, there are approximately seven homes and businesses subject to appreciable damage in the event of high flows in Manny Run. No estimate has been made of the maximum non-damaging flow at this point as the dam controls only approximately 50 percent of the watershed above this point. In the event of dam failure at full pool, extensive property damage and possible loss of life would be expected. Thus, a "High" hazard classification is justified.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual observations detected no evidence of existing or impending embankment stability problems. The inspection of the emergency spillway side channel slopes and the base of the spillway channel revealed no evidence of instability at the control section or along either the upstream or downstream sections. Careful inspection of the blanket drain outlet pipe detected no evidence of malfunction.

There was no spalling or concrete deterioration of the exposed portions of the principal spillway riser or conduit observed. The upstream slope of the dam was assessed to be quite stable and the woody vegetation recently removed. The downstream slope had a few small evergreen trees growing on the slope, which should be removed in the near future.

b. Design and Construction Data. Available design data is listed in Appendix A and described in Section 2 of this report. Design computations were not available for this investigation. Construction data was also unavailable, both from the DER and the State office of the Soil Conservation Service. However, the upstream and downstream embankment slopes were carefully inspected and, considering the type of materials used and the use of this structure for temporary flood retention, the configuration of the slopes appears to be stable with factors of safety significantly greater than 1.

c. Operating Records. Since the dam and reservoir have been designed to operate without valves or other mechanically operated devices, there are no operational records.

d. Post-Construction Changes. There are no reports, nor is there any evidence, that modifications of the dam or appurtenant structures were made.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since the static stability analysis was not available for review, the theoretical seismic stability of the dam could not be assessed.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Assessment. The visual inspection and review of the limited design and construction documentation indicates that the dam, foundation and appurtenant structures are performing satisfactorily and are in good condition. The hydrologic and hydraulic analyses performed by the Soil Conservation Service (SCS), and evaluated in Appendix C of this report, indicate that the structure will pass the Probable Maximum Flood. Thus, the spillway systems for this structure are considered to be "Adequate". In the event of failure, it is expected that appreciable property damage and possible loss of life could occur at the few homes and businesses at the damage center.

b. Adequacy of Information. The limited information available for this investigation was sufficiently adequate to evaluate the structure.

c. Urgency. It is considered that the recommendations presented below be implemented as soon as practical.

d. Necessity of Additional Studies. Additional investigations are not considered necessary for this structure.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be taken. They are presented in order of priority, but this does not infer that the latter recommendations are not important.

1. The swale at the right abutment should be filled with compacted soil to at least the same elevation as the dam.
2. The missing trash rack pipe on the intake riser should be replaced.
3. The woody vegetation on the downstream embankment slopes should be cleared during the normal maintenance program.

4. The riprapped discharge channel of the principal spillway should be inspected after each severe storm, especially in the area of the plunge pool, and repaired as necessary.
5. Since the only prepared access route to the dam is through the emergency spillway, an alternate route should be established to allow the monitoring of the structure during periods of high inflow from storm runoff.

b. Warning and Inspection Procedures. Because of the location of the dam upstream from the populated area near the intersection of Manny Run and Routes 423 and 191, a formal procedure of observation and warning during periods of high precipitation and associated runoff should be developed and implemented. In the event of an emergency, an emergency procedure for notifying downstream residents of a potentially hazardous condition should be developed.

APPENDIX

A

CHECK LIST		NAME OF DAM	<u>Greene Dreher Dam</u>	
ENGINEERING DATA		IU #	PA 00174	
DESIGN, CONSTRUCTION, OPERATION		PHASE 1		
ITEM	REMARKS	Sheet 1 of 4		
AS-BUILT DRAWINGS	DER files contained a 9 sheet set of design drawings			
REGIONAL VICINITY MAP	See Plate 1, Appendix E.			
CONSTRUCTION HISTORY	DER files contained only a few monthly progress summaries.			
TYPICAL SECTIONS OF DAM	See Appendix E.			
OUTLETS - PLAN		See Appendix E.		
DETAILS				
CONSTRAINTS		DER files contain several sheets of hydrographs prepared by SCS.		
DISCHARGE RATINGS				
RAINFALL/RESERVOIR RECORDS	Not available.			

ITEM	REMARKS
DESIGN REPORTS	None in DER files.
GEOLOGY REPORTS	None in DER files. See Appendix F.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None in DER files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None in DER files.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	Borrow source is located upstream of emergency spillway.

Sheet 3 of 4

ITEM	REMARKS
MONITORING SYSTEMS	<i>None</i>
MODIFICATIONS	<i>Unknown</i>
HIGH POOL RECORDS	<i>None</i>
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	<i>None</i>
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	<i>None</i>
Maintenance OPERATION RECORDS	<i>None</i>

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Appendix E.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E.
MISCELLANEOUS	<p>1. 7 black and white photos of the dam by DER.</p> <p>2. SCS inspection reports through 1977.</p> <p>3. "Application" dated 4 May 1960.</p> <p>4. "Permit" issued 6 June 1960.</p> <p>5. "Report Upon the Application" dated 4 May 1960.</p>

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam	<u>Greene Dreher Dam</u>	County	<u>Wayne</u>	State	<u>Pennsylvania</u>	National ID #	<u>PA 00124</u>
Type of Dam	<u>Earth</u>	Hazard Category	<u>I (High)</u>				
Date(s) Inspection	<u>25 Oct. 1978</u>	Weather	<u>Clear and Cool</u>	Temperature	<u>50°8</u>		

Pool Elevation at Time of Inspection 2016. M.S.L. Tailwater at Time of Inspection 2013.0 M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist) Raymond Lambert (Geologist) John H. Frederick (Geotechnical)
John Boschuk, Jr. (Civil) Vincent McKeever (Hydrologist) 24 Oct. 1978

John Boschuk, Jr. Recorder

Remarks:

Mr. George Caspera representing the county was on site and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

REMARKS OR RECOMMENDATIONS

ANY NOTICEABLE SEEPAGE

N/A

STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS

DRAWINGS

WATER PASSAGES

FOUNDATION

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

SURFACE CRACKS
CONCRETE SURFACES

STRUCTURAL CRACKING

VERTICAL AND HORIZONTAL
ALIGNMENT

MONOLITH JOINTS

CONSTRUCTION JOINTS

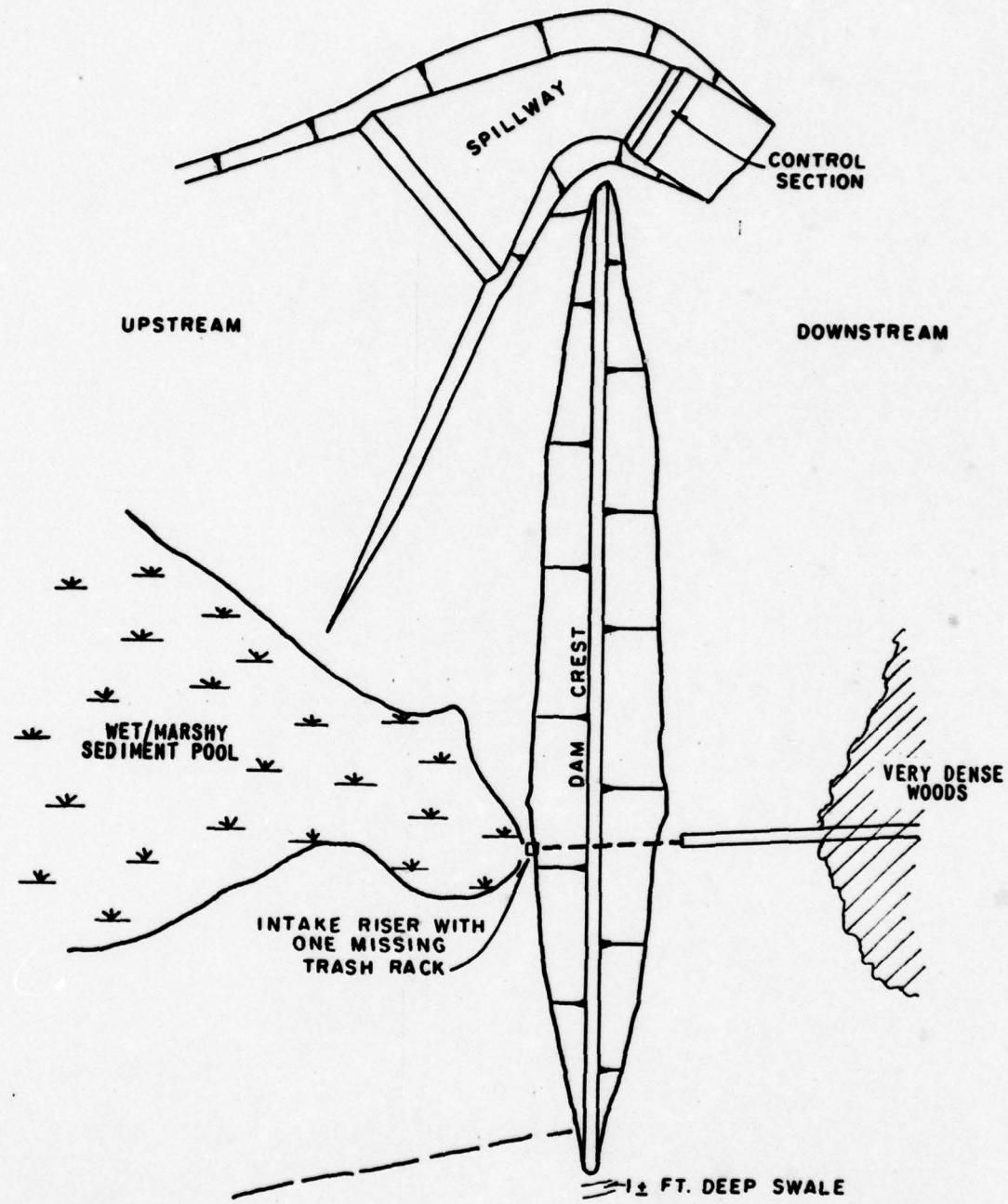
EMBANKMENT

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLoughing or Erosion of Embankment and Abutment Slopes	None observed.	
Vertical and Horizontal Alignment of the Crest	No unusual misalignments were observed. Minor trail bike damage to crest of dam. A one foot deep swale was noted in the right abutment approximately 15 feet from the end of the dam. This swale would be the first point of overtopping.	
RIPRAP FAILURES	None observed.	

EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF EMBANKMENT SLOPES</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	All junctions were observed to be in good condition.	
ANY NOTICEABLE SEEPAGE	None observed.	
STAFF GAGE AND RECORDER	None	
DRAINS		Only one six inch CMP drain was observed on the left side of the principal spillway discharge pipe. It was dripping slightly.



SEEPAGE LOCATION PLAN
SHEET 5A OF 11

OUTLET WORKS

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
<u>CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT</u>	No cracking or significant spalling of the intake tower was observed. The conduit could not be inspected.	
<u>INTAKE STRUCTURE</u>	The exposed portions of the intake riser were inspected and found to be in good condition. However, one of the trash racks was missing and should be replaced.	
<u>OUTLET STRUCTURE</u>	The outlet pipe was found to be in good condition.	
<u>OUTLET CHANNEL</u>	The channel was observed to be stable and in good condition.	
<u>EMERGENCY GATE</u>	The pond drain gate is inoperable and the county representative stated that ARMCO (manufacturer) will be asked to evaluate the condition and recommend repairs.	

UNGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	The grass lined channel with the grass lined control section was inspected and found to be in good condition.	REMARKS BY SPILLWAY INSPECTOR DATE: 2/20/02 SIGNATURE: [Signature]
APPROACH CHANNEL	Good condition.	REMARKS BY SPILLWAY INSPECTOR DATE: 2/20/02 SIGNATURE: [Signature]
DISCHARGE CHANNEL	Good condition.	REMARKS BY SPILLWAY INSPECTOR DATE: 2/20/02 SIGNATURE: [Signature]
BRIDGE AND PIERS	None	REMARKS BY SPILLWAY INSPECTOR DATE: 2/20/02 SIGNATURE: [Signature]

GATED SPILLWAY

Sheet 8 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE SILL	<i>None</i>	
APPROACH CHANNEL	<i>None</i>	
DISCHARGE CHANNEL	<i>None</i>	
BRIDGE AND PIERS	<i>None</i>	
GATES AND OPERATION EQUIPMENT	<i>None</i>	

2000-03-14

Mississippi

INSTRUMENTATION

	VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		<i>None</i>	
OBSERVATION WELLS		<i>None</i>	
WEIRS		<i>None</i>	
PIEZOMETERS		<i>None</i>	
OTHER		<i>None</i>	

Sheet 9 of 11

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
Sheet 10 of 11		

RECOMMENDATIONS

REMARKS OR RECOMMENDATIONS

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SLOPES

Reservoir slopes are moderate and wooded.

SEDIMENTATION

Minimal sedimentation no effect on £/tond storage

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	<p>The discharge channel has little or no debris in it and flows through a wooded flood plain.</p>	
SLOPES	<p>The valley gradient is about 0.04. The channel banks are two to four feet high with side slopes ranging from 2H:1V to 3H:1V and were assessed to be stable.</p>	
APPROXIMATE NO. OF HOMES AND POPULATION	<p>The houses (seven or more) and businesses subject to damage in the event of failure are located about 1.4 miles downstream of the dam and about 500 feet upstream of the confluence of Manny Run with Taylor Creek.</p>	

APPENDIX

C

GREENE-DREHER
(SCS PA 447)
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 95% wooded, some residential development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2019.5 feet (4 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 2036.0 feet (196 Acre-Feet).

ELEVATION MAXIMUM DESIGN POOL: 2033.8 feet. (Design High Water).

ELEVATION TOP DAM: 2036.0 feet; 2035.0 (swale).

EMERGENCY SPILLWAY

a. Elevation 2031.5 feet.

b. Type Trapezoidal channel cut through natural materials.

c. Width 100 feet.

d. Length Approximately 350 feet.

e. Location Spillover Left abutment.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type Drop inlet riser, conduit and plunge pool.

b. Location Approximately 650 feet from left abutment.

c. Entrance inverts Weir, 2024.0 feet, low stage inlet, 2019.5 feet.

d. Exit inverts 2014.7 feet.

e. Emergency draindown facilities 12 inch pond drain at 2016.5 feet.

HYDROMETEOROLOGICAL GAGES:

a. Type None.

b. Location N/A.

c. Records N/A.

MAXIMUM NON-DAMAGING DISCHARGE: Not determined.

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 4 Jan. 79
By: MFA
Sheet: 2 of 10

DAM Greene-Dreher SC3 PA 447 Nat. ID No. PA 00174 DER No. 64-174

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	<u>2036.0</u>		
2. Freeboard, ft.	<u>0.5</u>		
3. Spillway ⁽¹⁾ Crest Elev, ft.	<u>2031.5</u>		
3a. Secondary ⁽²⁾ Crest Elev, ft.	<u>2024.0</u>		
4. Max. Pool Elev., ft.	<u>2035.5 (PMF)</u>		
5. Max. Outflow ⁽³⁾ , cfs	<u>1660</u>		
6. Drainage Area, mi ²	<u>0.55</u>		<u>0.37</u>
7. Max. Inflow ⁽⁴⁾ , cfs	<u>2740</u>		<u>1584</u>
8. Reservoir Surf. Area, Acre	<u>3.5</u>		<u>3.7</u>
9. Flood Storage ⁽⁵⁾ , Ac-Ft	<u>128</u>		

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

- (1) Main emergency spillway.
- (2) Secondary ungated spillway.
- (3) At maximum pool, with freeboard, ungated spillways only.
- (4) For columns B, C, use PMF.
- (5) Between lowest ungated spillway and maximum pool.

Date: 1/4/79
By: MFB
Sheet: 9 of 10

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from sheet 2)	Source
1A, 3A, 3aA, 6A 8A, 9A	Design drawings dated April 1960
2A, 4A, 5A, 7A	Flood routing dated March 1960
6C, 8C	USGS Maps Tobyhanna, Pa (1973) Sterling, Pa (1973) Newfoundland, Pa (1973) Buck Hill Falls, Pa (1973)
7C	Computer program, see sheet 9

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quadrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputted and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MEG DATE 1/4/79
CHKD BY (JW) DATE 3/2/79

SUBJECT Green-Dreher
SCS Dam PA 447
Hydrology / Hydraulics

SHEET 5 OF 10
JOB NO.

Classification - (Ref - Recommended Guidelines for Safety Inspection of Dams)

1. The hazard classification is rated as "High" as there would be probable loss of life if the dam failed.
2. The size classification is "Small" based on its 196 Ac-Ft. total storage capacity (to top of dam).
3. The spillway design flood, based on size and hazard classification, is 0.5 to 1.0 PMF (Probable Maximum Flood).

Hydrologic/Hydraulic Analysis

Design information available for review is included in this report as Plates in Appendix E and on sheet 10 of this Appendix. The PMF inflow hydrograph and flood routing were determined according to procedures in the SCS National Engineering Handbook, Sections 4 & 5.

The components of the flood routing were determined to be adequate by the following methods:

1. The elevation-curve. Areas from the SCS reservoir area drawing were measured and volumes computed. Original ground contours were used.

elev.	area	vol.	total flood storage
-------	------	------	---------------------

2019.5 ft.	1.75 Ac	1.18 Ac-Ft	0
------------	---------	------------	---

2020	3.0	78.14	1.18 Ac-Ft.
------	-----	-------	-------------

2030	12.6	58.36	79.32
------	------	-------	-------

2034	72.10		139.68
------	-------	--	--------

2036			173 ± by
------	--	--	----------

extrapolation,
close to maximum
available flood
storage shown
on sheet 10

BY MFB DATE 1/5/79
CHKD BY (initials) DATE 1/11/79

SUBJECT Greene-Dreher
SCS PA 447
Hydrology / Hydraulics

SHEET 6 OF 10
JOB NO.

2. The elevation-discharge curve, checked using current SCS criteria, TR-39.

Total head forcing flow in emergency spillway, H_p , is > 4.5 ft. (field checked)

Critical specific energy, H_{ec} , is about 3.9 ft. from ES-171, sheet 8.

Critical depth, $d_c \approx 2.65$ ft., ES-174, sheet 5

Critical discharge, $Q_c \sim 2500$ cfs, ES-174, sheet 5

Note, the design approach channel has steeper bottom slopes, thus a larger value for H_{ec} & Q_c . Therefore, the design value, 2740 cfs, as shown on sheet 10 is adequate.

3. The inflow hydrograph. The drainage area used for the design hydrograph computations is 0.55 sq. miles, greater than 0.37 sq. miles obtained from current USGS maps. It is noted that the USGS maps are based on a 1963 survey, subsequent to the design of this dam.

The runoff curve number, CN=6.2, appears to be low for the hydrologic class C soils of the watershed. Therefore, the HEC-1, Rev. computer inflow hydrograph is based on a curve number of 70* (and an area of 0.37 sq. miles). (Ref- SCS Soil Survey of Wayne County). Computer program used as a check on hydrograph.

The computed peak inflow is 1584 cfs, sheet 9, less than the peak inflow value on sheet 10.

4. The outflow hydrograph was checked according to SCS methods and found adequate. (Ref- National Engineering Handbook, Section 5)

* Based on hydrologic class C soils and the land use within the watershed.

MFB

1/8/79

Greene-Dreher
SCS DA 447
Hydrology / Hydraulics

SHEET 7 OF 10

GREENE-DREHER DAM SCS PA 44/
NAT ID N.U. PA 00174 DER NO. 64-174
INELON HYDROGRAPH

JOB SPECIFICATION								INSTAN	
NR	NHR	NMIN	IDAY	IHR	IMIN	METRC	IFLT	IPRI	
1000	0	15	0	0	0	0	0	4	0
			JOPER	NUT	LROPY	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

KTIOS = 1.00

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MFB

1/8/78

Greene-Dreher

SCS PA 447

Hydrology / Hydraulics

SHEET 8 OF 10

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH		
ISTAQ	ICOMP	IECON ITAPE
INFLW	0	0 0
		JPLT 0
		JPRF 0
		I NAME 1
		I STAGE 0
		I AUTO 0

HYDROGRAPH DATA		
IHYD	IUNG	TAREA
1	2	SNAF .37
		TRSDA .37
		TRSFCC 0.00
		RATIO 0.000
		ISNOW 0
		ISAME 1
		LOCAL 0

PRECIP DATA		
SPFE	PMS	R6
0.00	21.00	111.00
	R12	R24
	R48	R72
	R96	0.00
		0.00

TRSFC COMPUTED BY THE PROGRAM IS .800

LOSS DATA		
LROPT	STRKR	RTOL
0	0.00	1.00
		ERAIN 0.00
		STRKS 0.00
		RTOK 1.00
		STRTL -1.00
		CNSTL -70.00
		ALSMX 0.00
		RTIMP 0.00

CURVE NO = -70.00 WETNESS = -1.00 EFFECT CN = 70.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG=.60

RECEDITION DATA
STR0= -1.50 ARCSN= -.05 RTIOR= 2.00

END-OF-PERIOD FLOW		
MO.DA	HR.MN	PERIOD
0	RAIN	EXCS LOSS
MO.DA	HR.MN	PERIOD
		RAIN
		EXCS
		LOSS
		COMP A
		COMP B
		COMP C
		COMP D

SUM	23.86	19.39	4.47	18716.
(606.)	(492.)	(114.)	(529.98)	

MFB

1/8/79

Greene-Dreher
SCS PA 447
Hydrology / Hydraulics

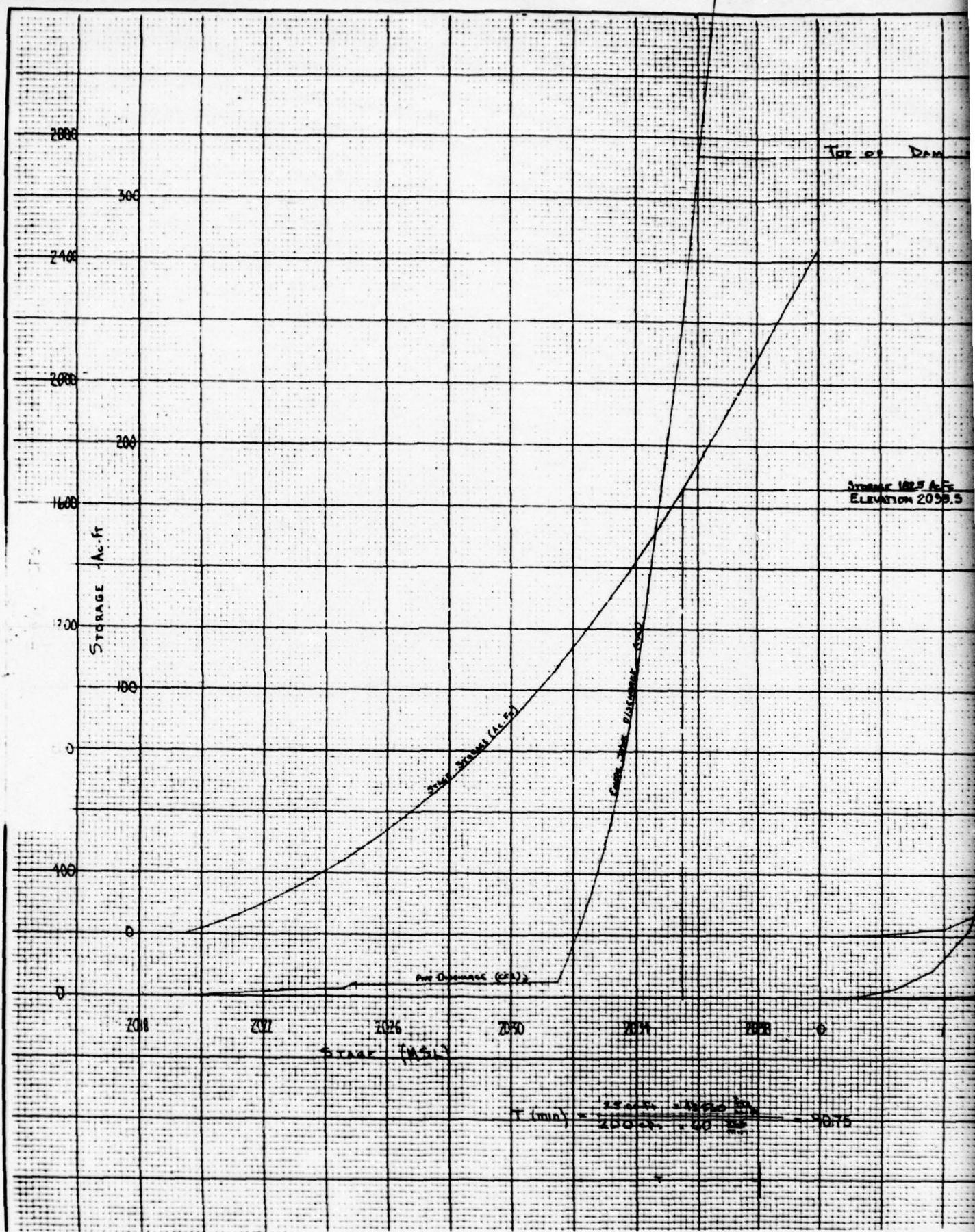
SHEET 4 OF 10

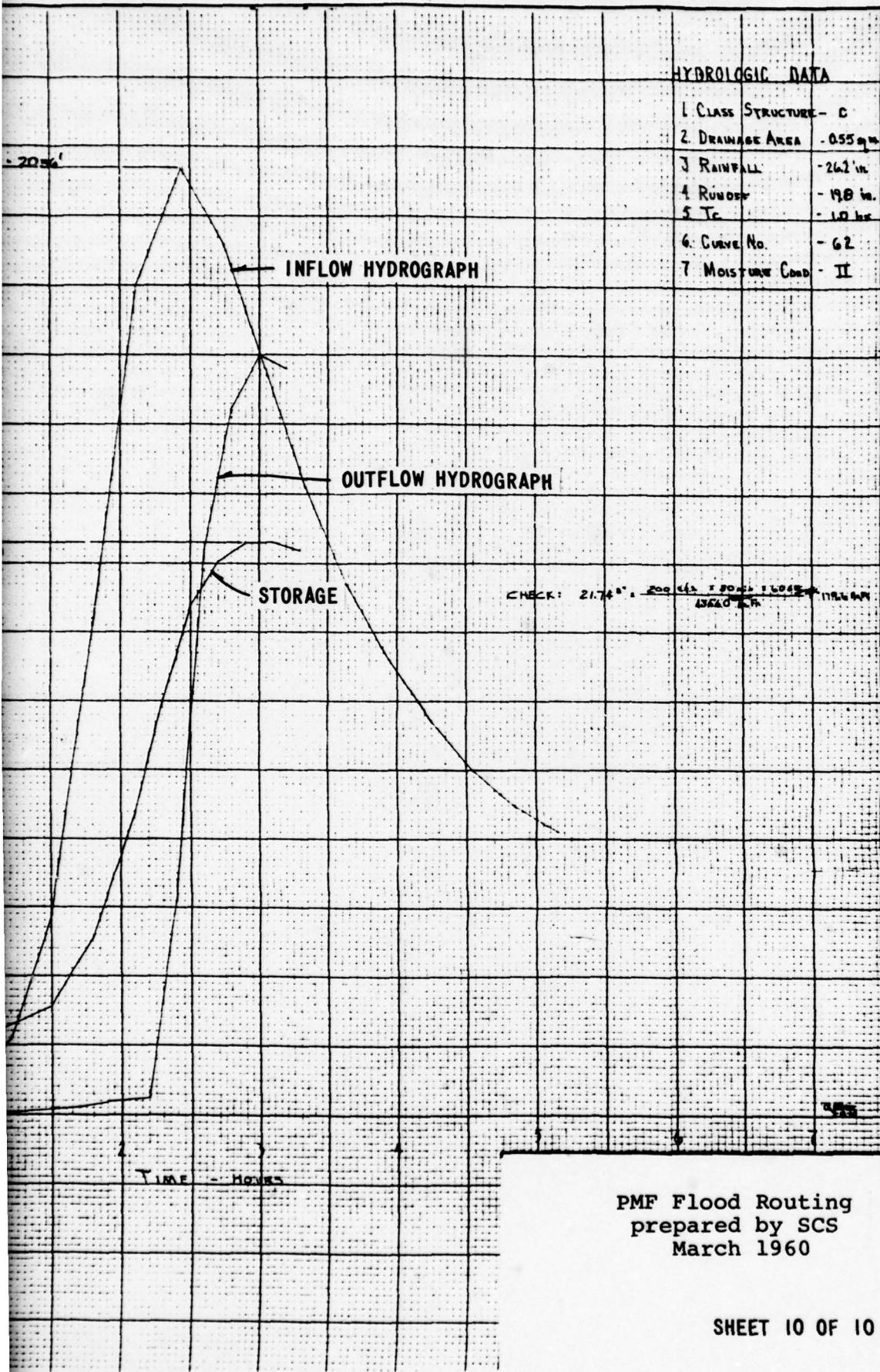
PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO	1
					1.00

HYDROGRAPH AT INFLOW	(.37	1	1584.
		.97)	(44.86)





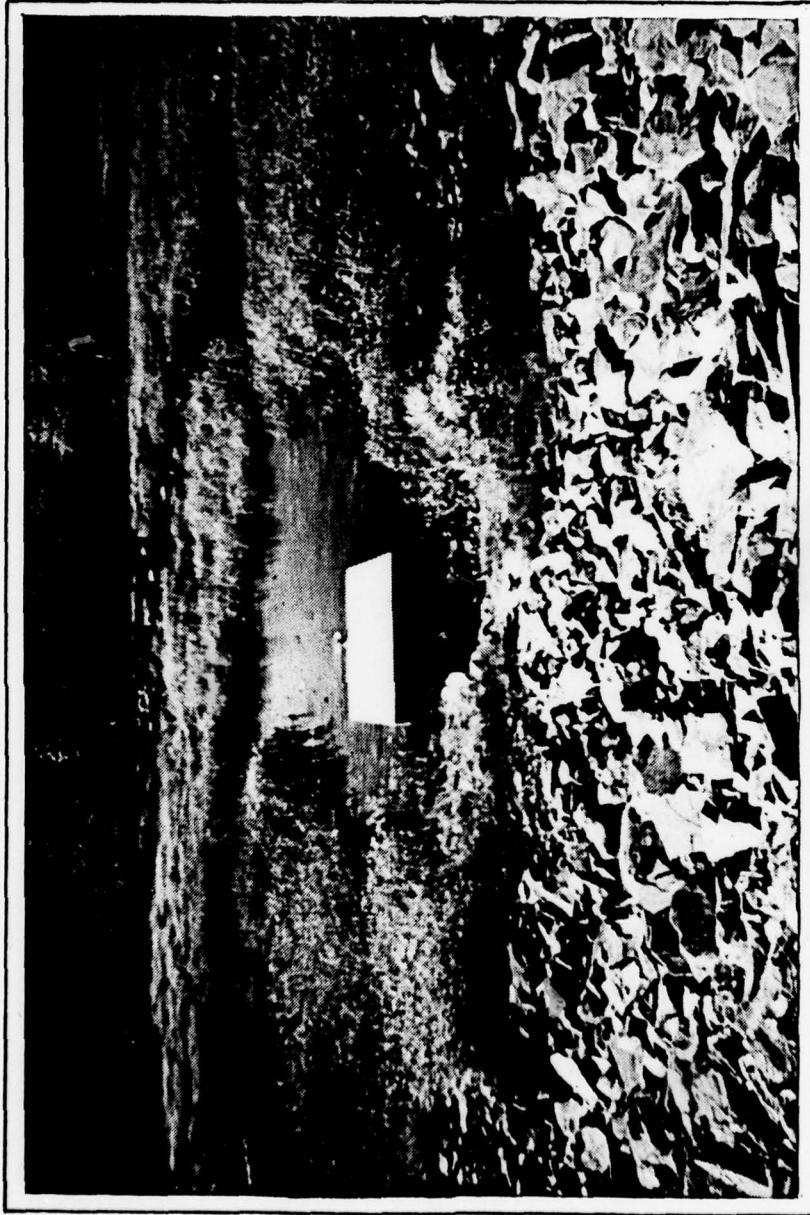
PMF Flood Routing
prepared by SCS
March 1960

SHEET 10 OF 10

2

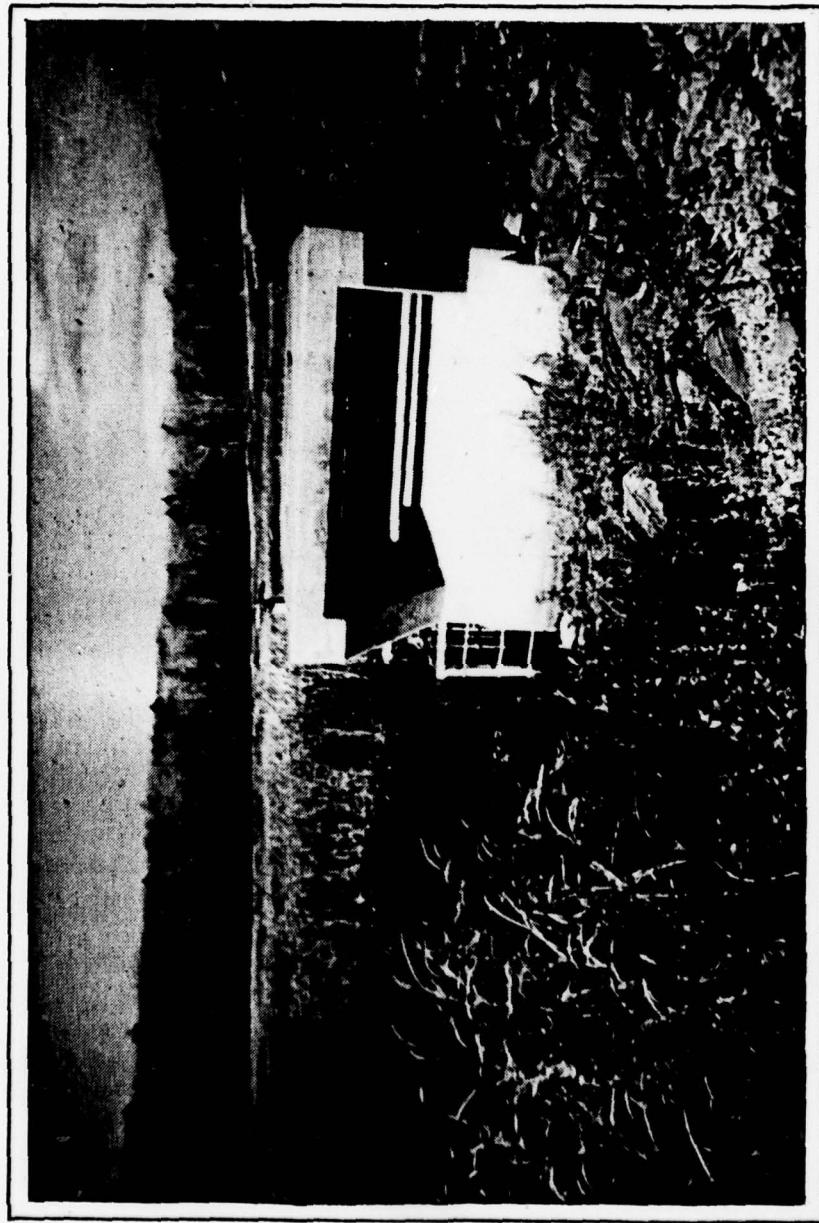
APPENDIX

D



INTAKE RISER AND PRINCIPAL SPILLWAY.

PHOTOGRAPH NO. 1



SIDE VIEW OF RISER. NOTE TRASH RACKS
AND THAT ONE IS MISSING.

PHOTOGRAPH NO. 2

PHOTOGRAPH NO. 3

OUTLET PIPE FOR PRINCIPAL SPILLWAY.

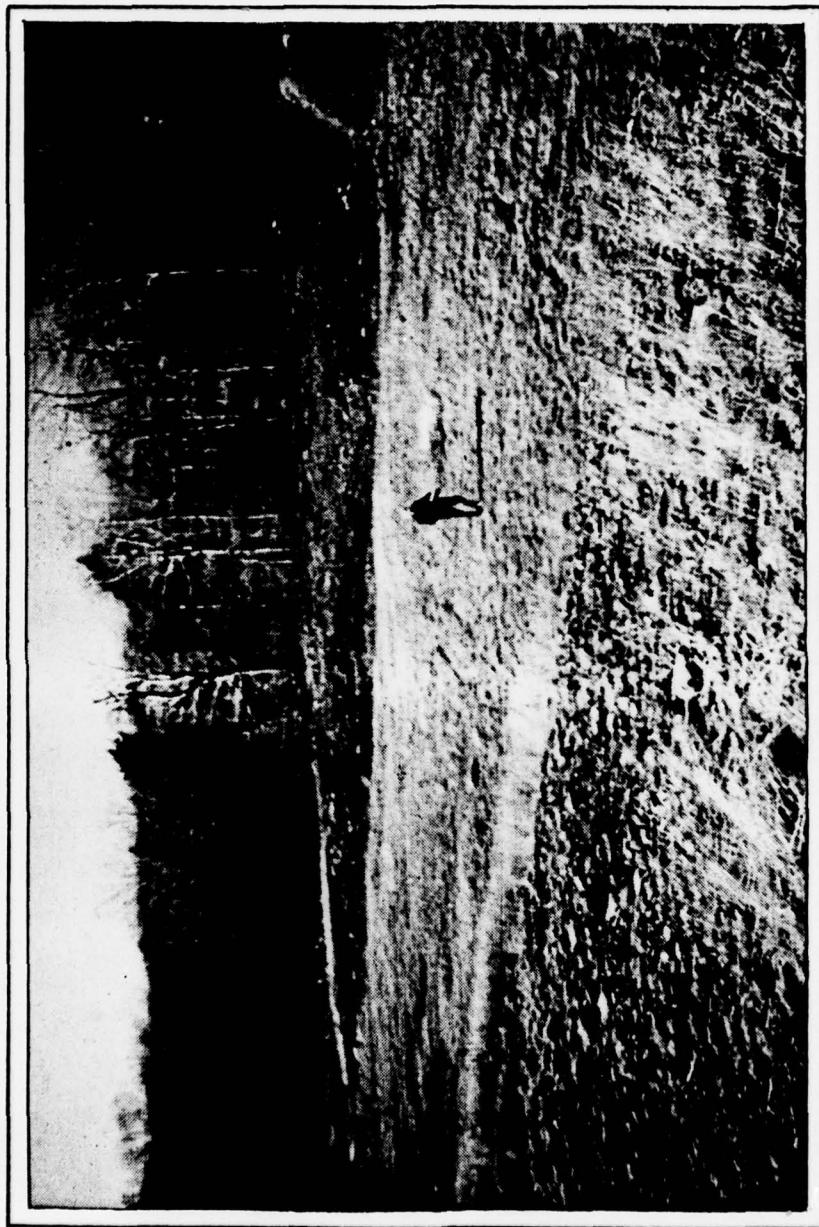


PHOTOGRAPH NO. 4

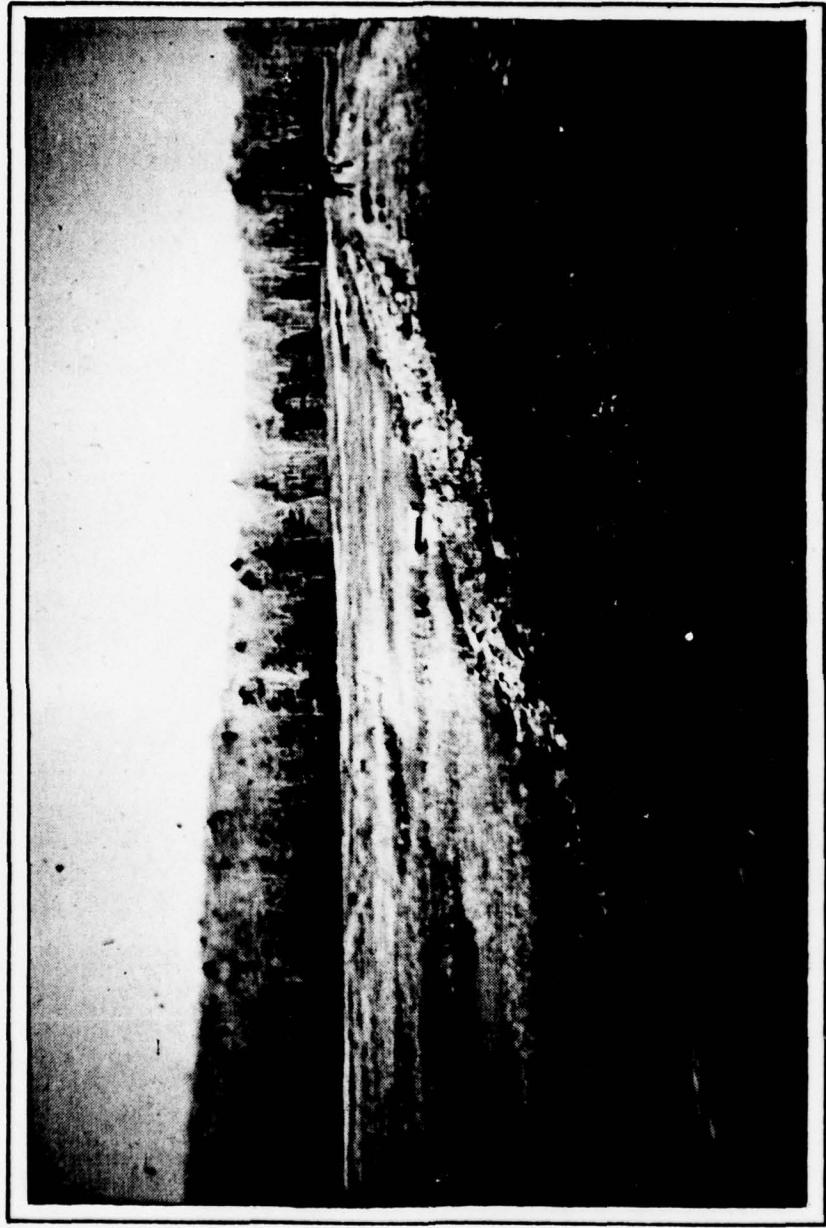
CHANNEL BELOW PRINCIPAL SPILLWAY.



PHOTOGRAPH NO. 5

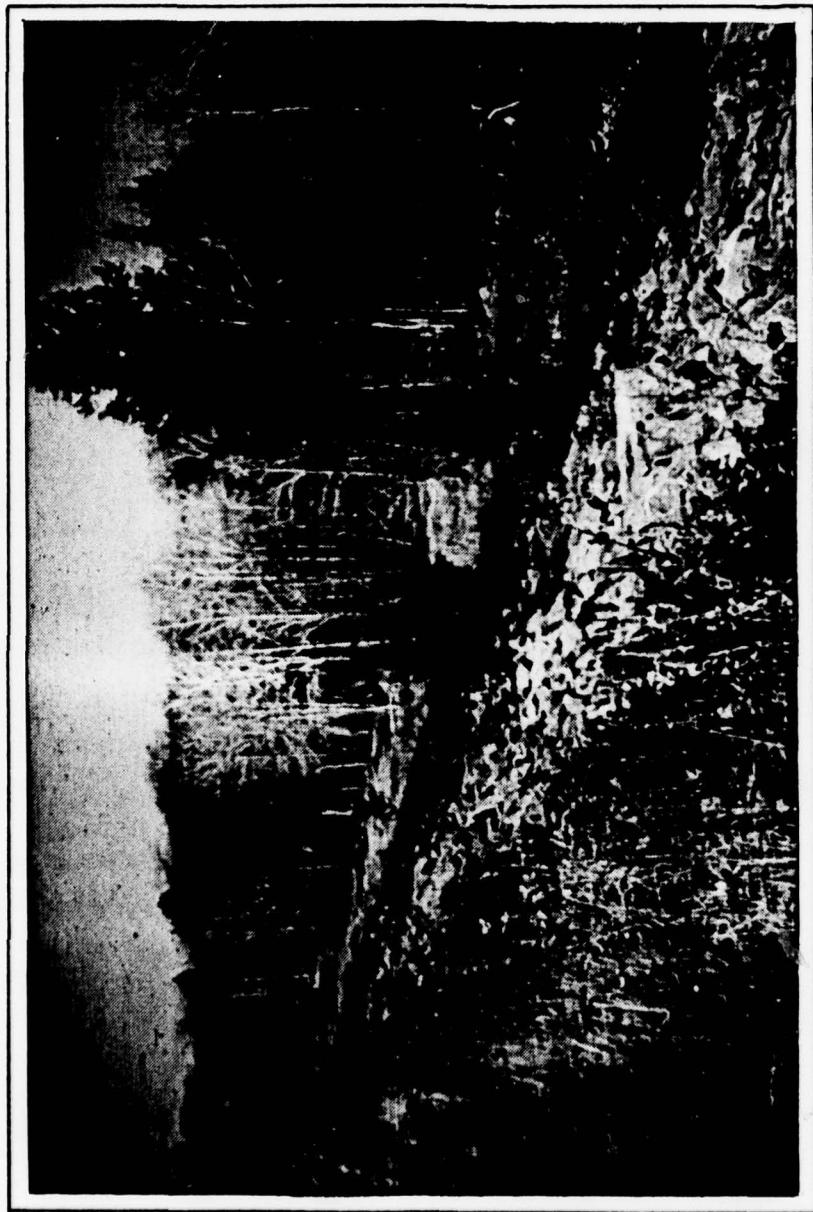


OVERVIEW OF EMERGENCY SPILLWAY
LOOKING UPSTREAM FROM LEFT END
OF EMBANKMENT.



OVERVIEW OF UPSTREAM SLOPE AND CREST
LOOKING FROM THE RIGHT ABUTMENT.

PHOTOGRAPH NO. 6



OVERVIEW OF DOWNSTREAM SLOPE.

PHOTOGRAPH NO. 7

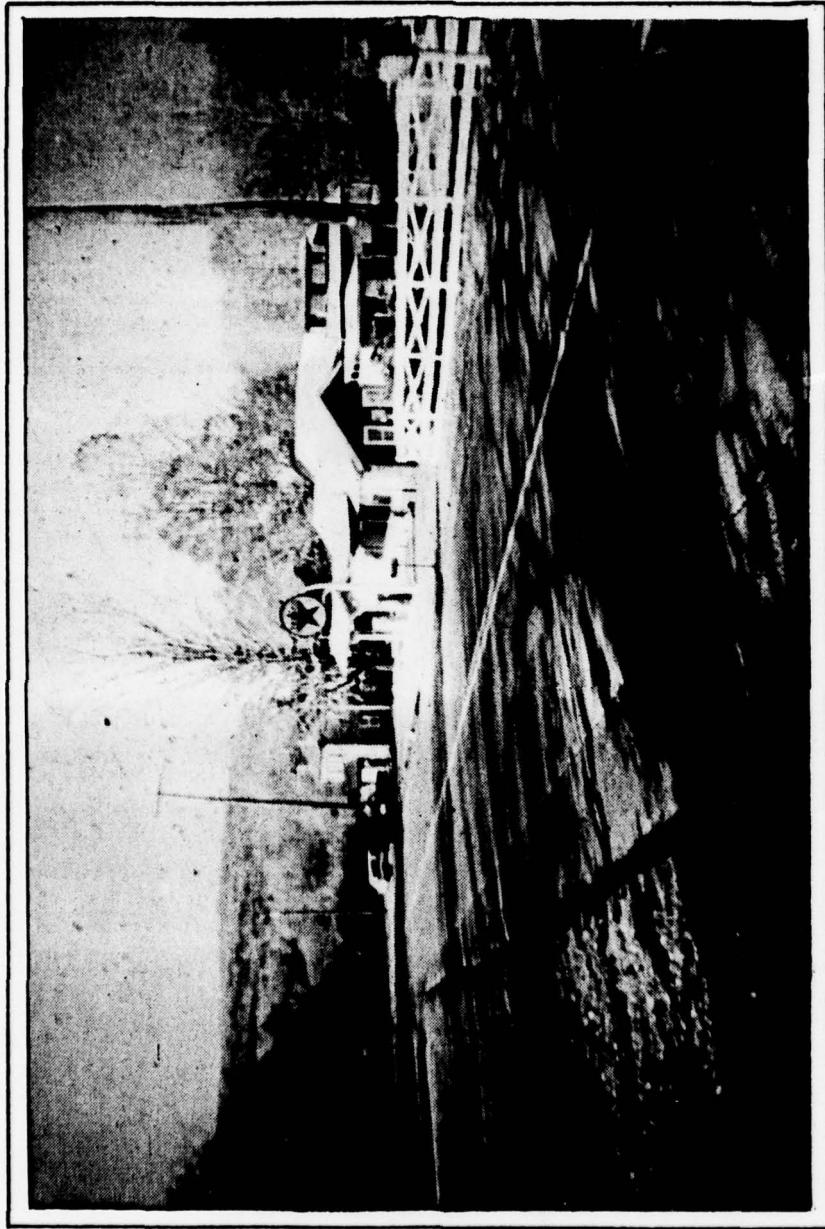


VIEW OF BRIDGE DOWNSTREAM AT
ROUTE 423.



MANNY RUN STREAM CHANNEL EAST OF
ROUTE 191 SHOWN IN PHOTOGRAPH 8.
NOTE HOUSE ON LEFT.

PHOTOGRAPH NO. 9

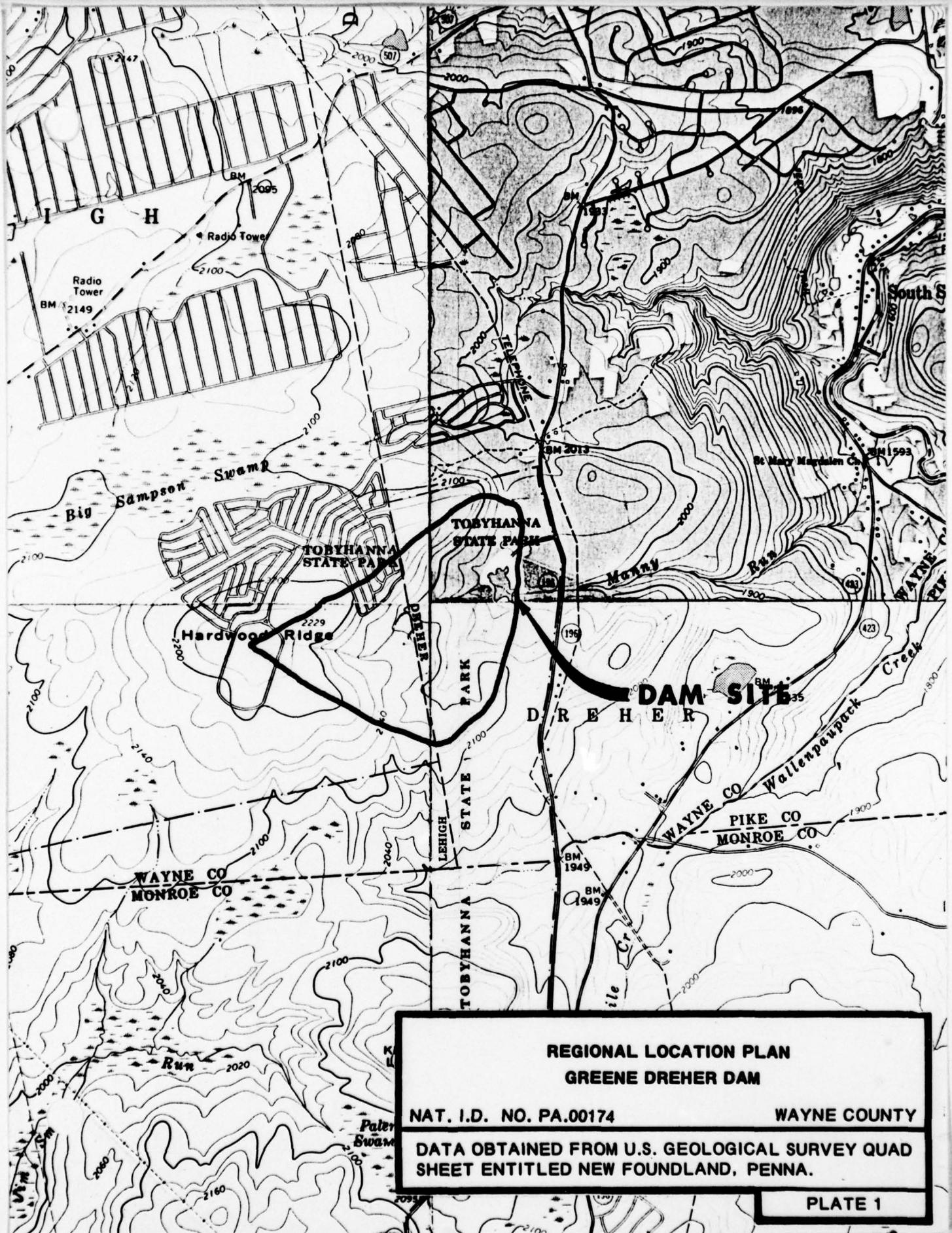


POPULATED AREAS ALONG ROUTE 191
ADJACENT TO MANNY RUN.

PHOTOGRAPH NO. 10

APPENDIX

E



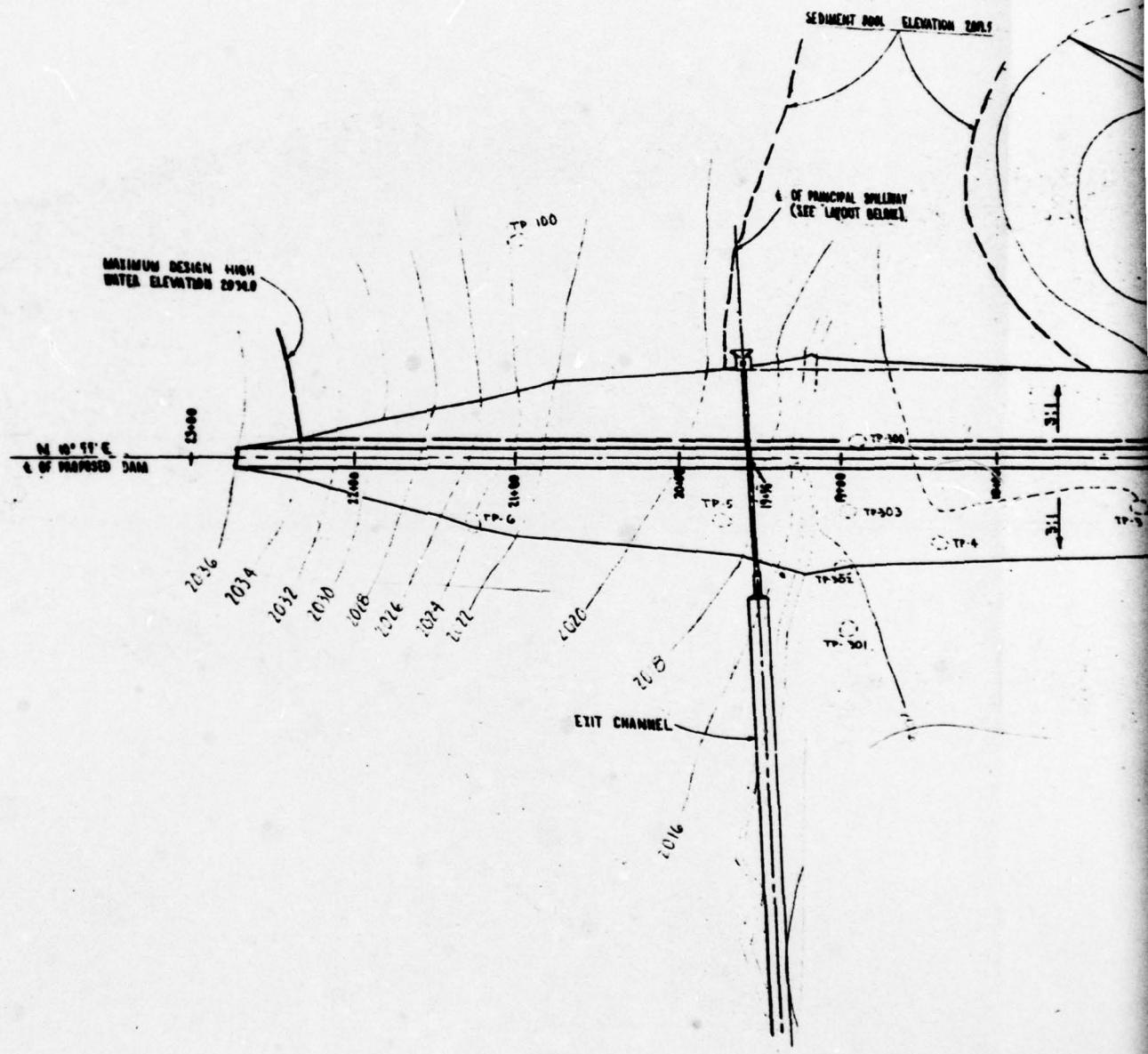
**REGIONAL LOCATION PLAN
GREENE DREHER DAM**

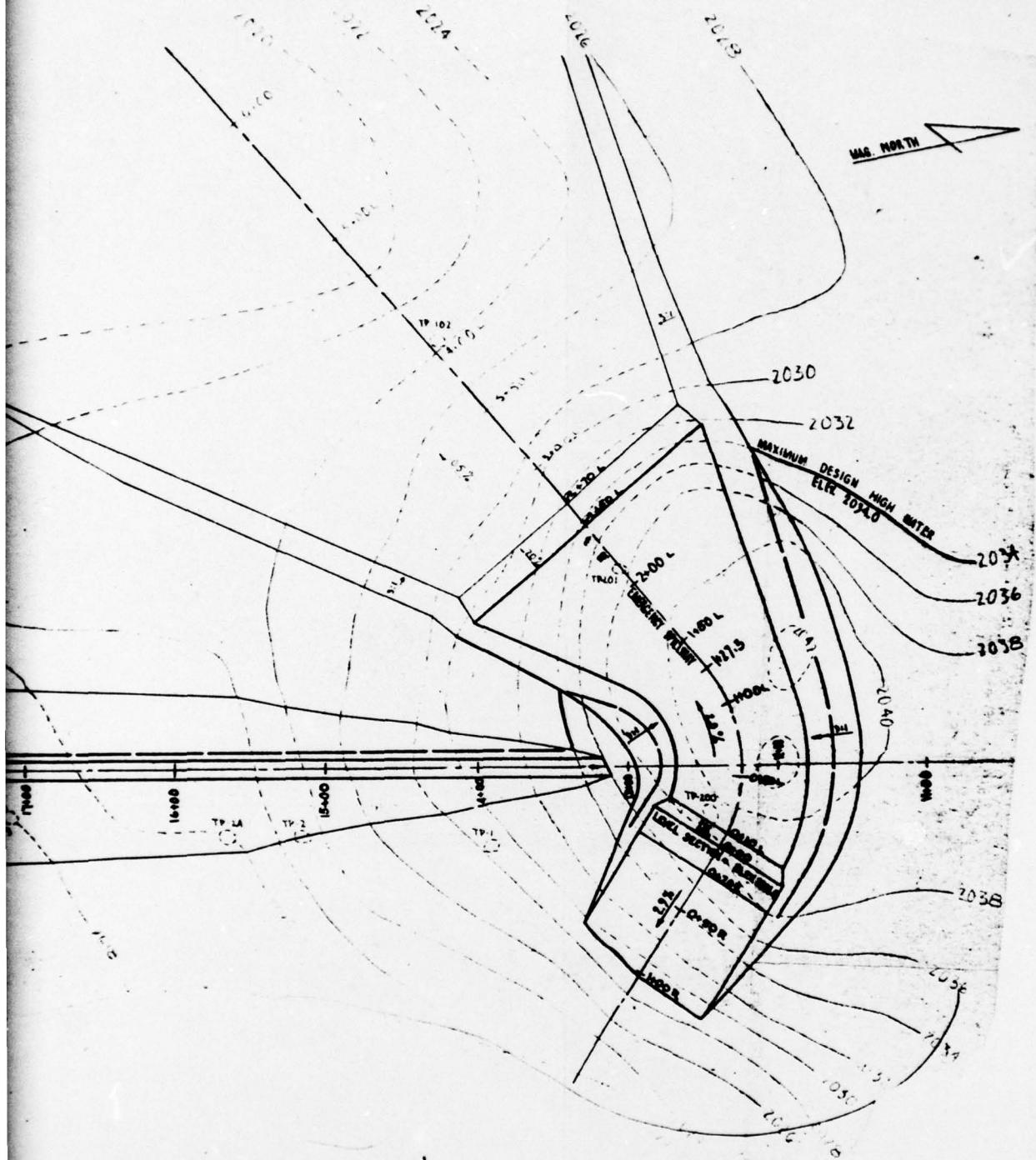
NAT. I.D. NO. PA.00174

WAYNE COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD
SHEET ENTITLED NEW FOUNDLAND, PENNA.

PLATE 1





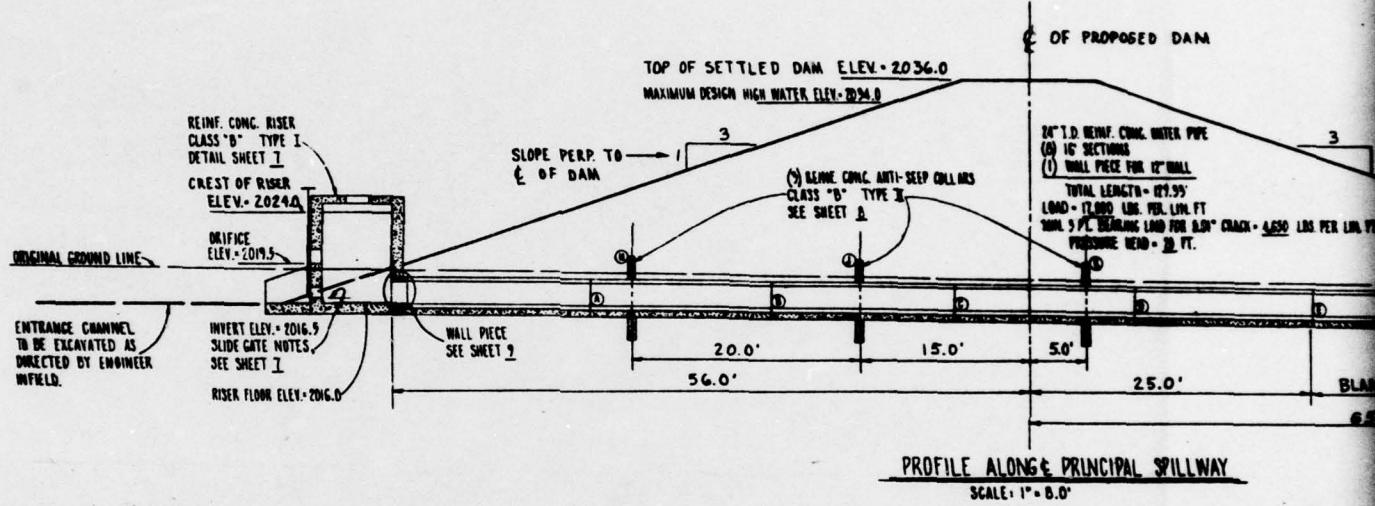
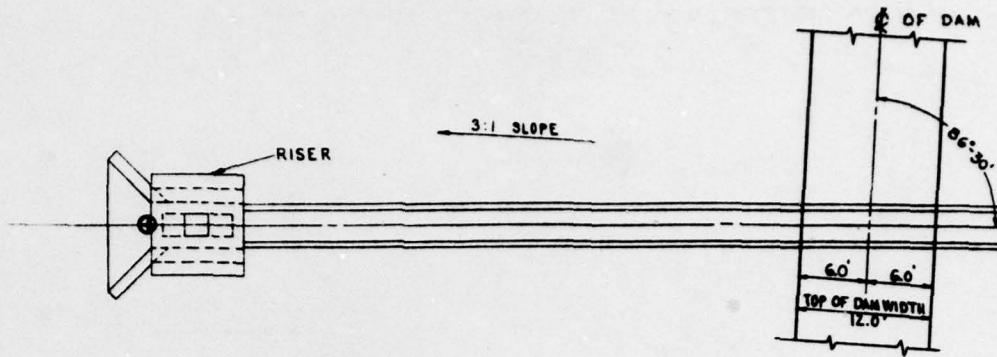
**PLAN OF DAM AND SPILLWAY
GREENE DREHER DAM**

NAT. I.D. NO. PA.00174

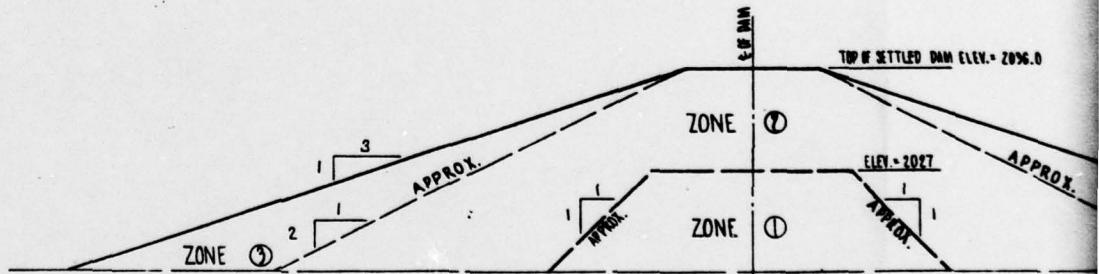
WAYNE COUNTY

**DATA OBTAINED FROM U.S.DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA- 447 - P,
SHEET NO. 3 OF 9, DATED MAR. 1960**

PLATE 2



PROFILE ALONG PRINCIPAL SPILLWAY
SCALE: 1" = 8.0'



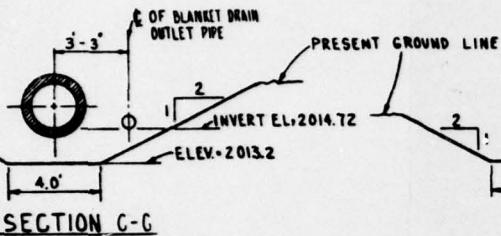
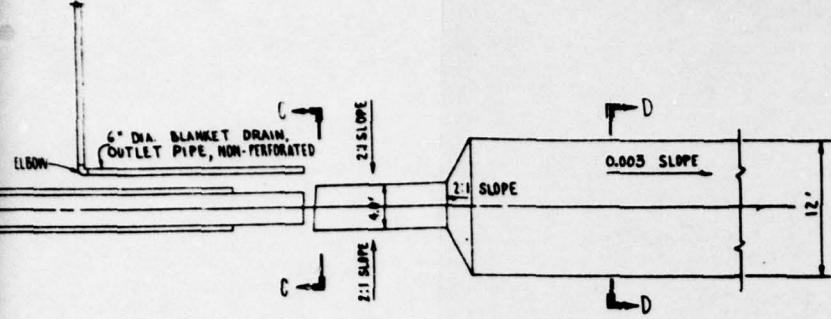
ZONE ①
COMPACTED FILL CLASS A-3
ML AND SM MATERIAL.

ZONE ②
COMPACTED FILL CLASS A-3
GM AND SM MATERIAL.

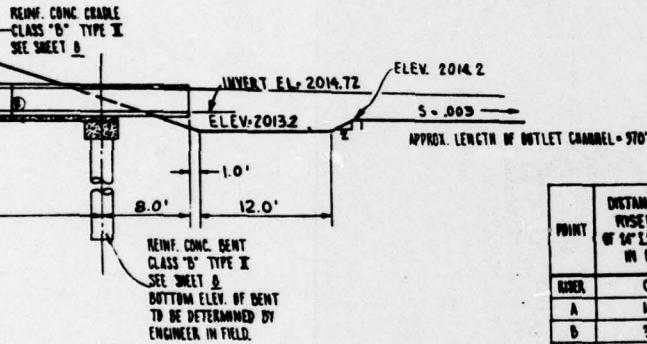
ZONE ③
DISPOSAL AREA FOR ROCK LARGER THAN
6" RADED FROM COMPACTED FILL ZONES,
INCLUDED AS COMPACTED FILL.
SETTLEMENT IN PLACE, OF THIS MATERIAL,
TO BE MADE BY ROUTING OF CONSTRUCTION
EQUIPMENT.

TYPICAL SECTION OF DAM

FINAL PLACEMENT (PROPORTIONING OF
FILL TO BE DETERMINED IN THE FIELD
BY THE ENGINEER)



SECTION D-D



POINT	DISTANCE FROM RISER END OF 6" I.D. CRADLE IN FEET	INVERT E.L. OF 6" I.D. CRADLE WITH CRADLE
RISER	0	2013.00
A	16	2013.97
B	32	2015.93
C	48	2015.90
D	64	2015.86
E	80	2015.80
F	96	2015.79
G	112	2015.81
OUTLET	128	2014.72
H	20	2015.96
J	40	2015.92
K	-60	2015.87

NOTE: ABOVE PIPE LENGTHS ARE BASED
ON NOMINAL SIZE, AND DO NOT
INCLUDE CREEP.

MAXIMUM CAMBER = 0.50 FT. @
POINT "D"

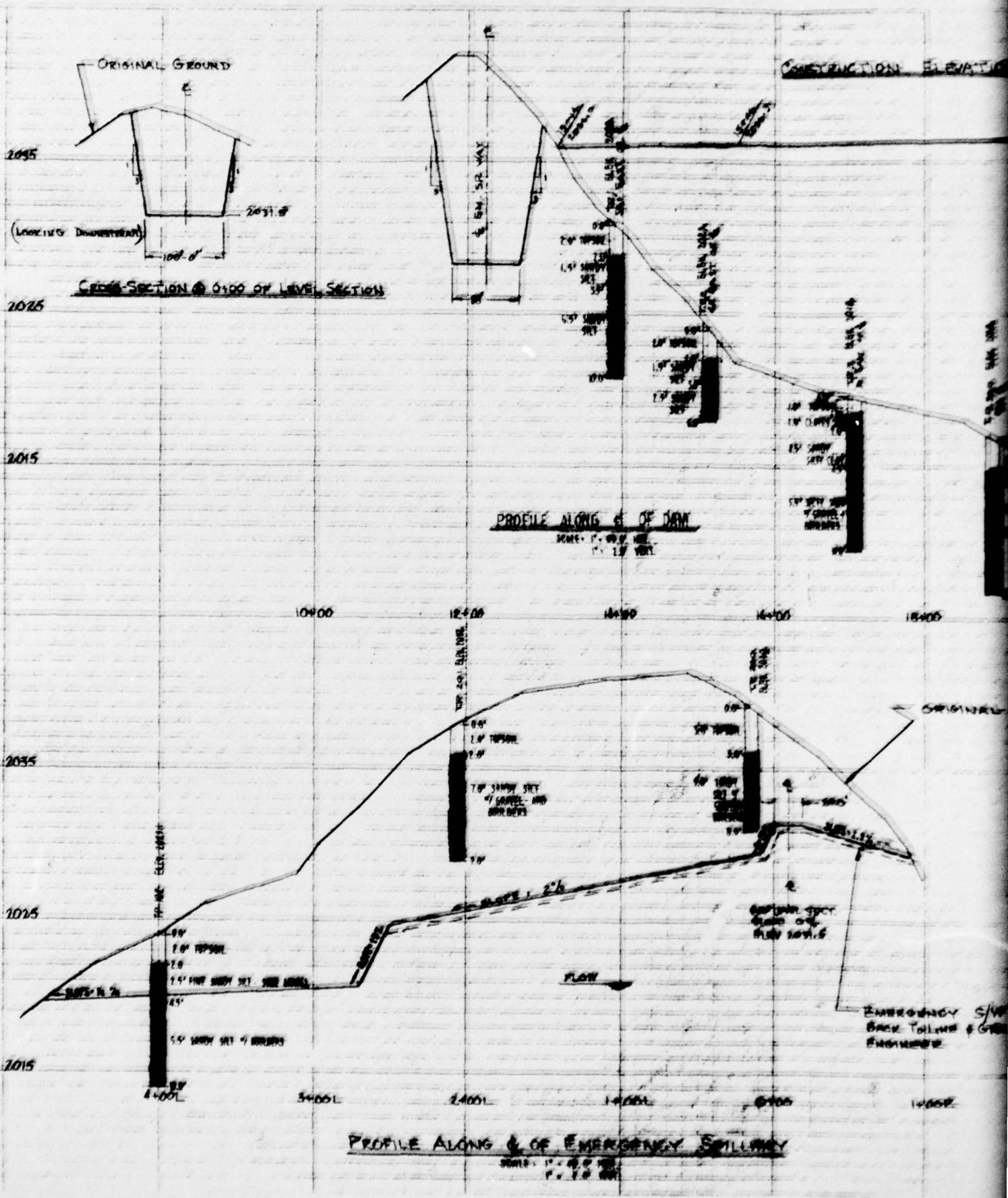
PRINCIPAL SPILLWAY AND EMBANKMENT SECTIONS
GREENE DREHER DAM

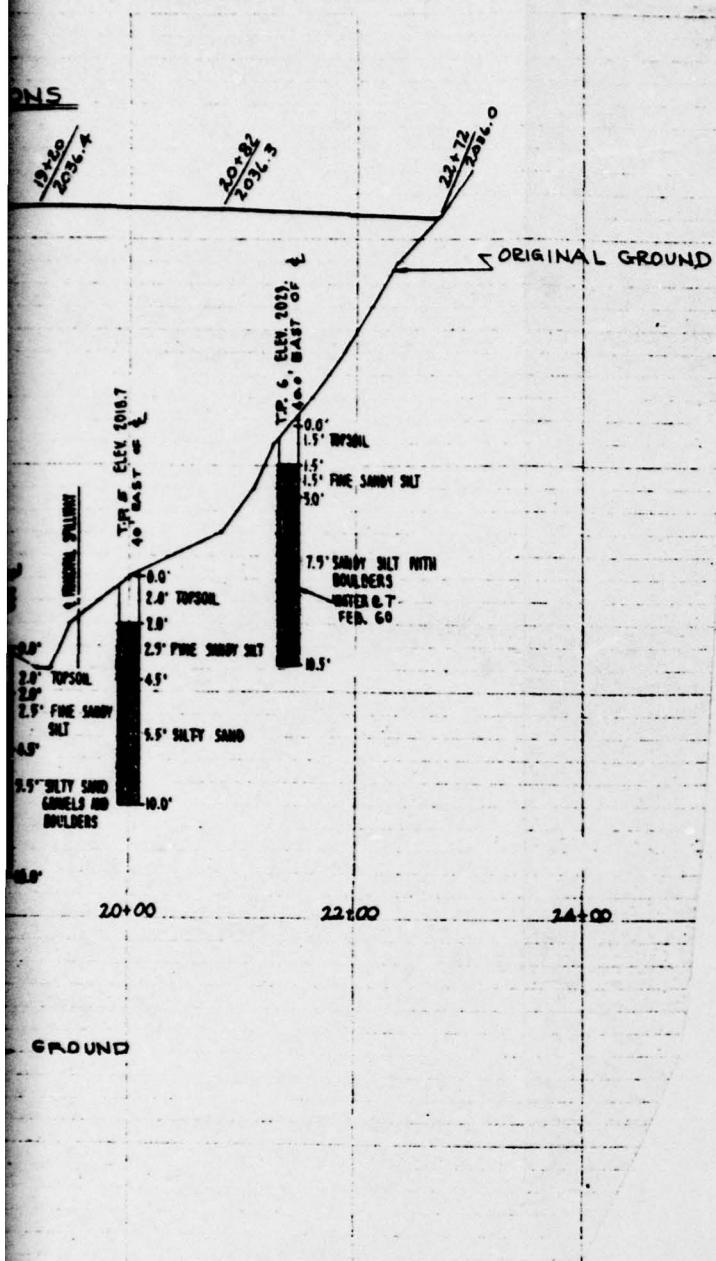
NAT. I.D. NO. PA.00174

WAYNE COUNTY

DATA OBTAINED FROM U.S.DÉPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA - 447 - P,
SHEET 6 OF 9, DATED MAR. 1960

PLATE 3





W TO BE UNDERCUT 0'-6" & BROUGHT
ADE AS DIRECTED IN FIELD BY

EMERGENCY SPILLWAY AND DAM PROFILE

GREENE DREHER DAM

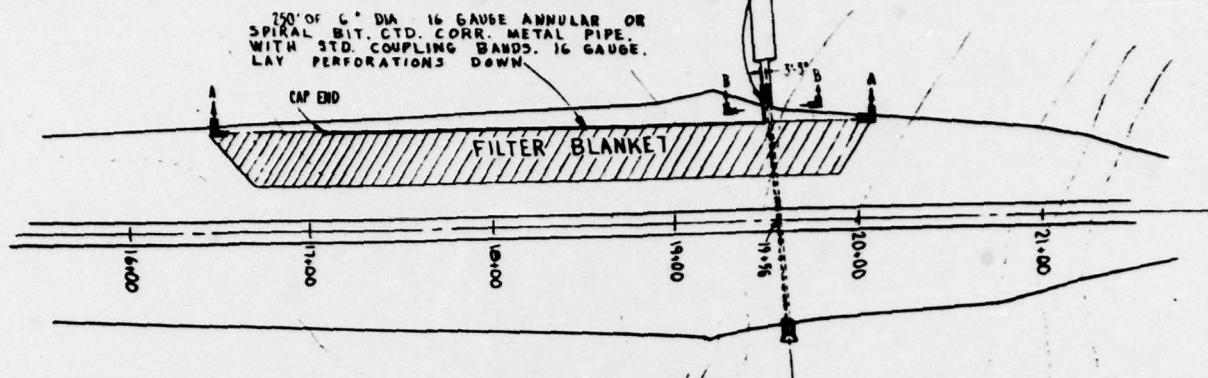
NAT. I. D. NO. PA.00174

WAYNE COUNTY

**DATA OBTAINED FROM U.S.DEP'T. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA. - 447- P,
SHEET 4 OF 9, DATED MAR. 1960**

PLATE 4

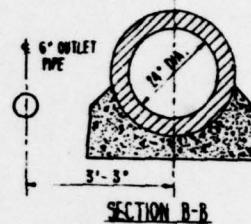
20' LEFT SIDE OF PRINCIPAL SPILLWAY,
OF 6' DIA, 16 GAUGE, ANNULAR OR SPIRAL
BIT. CTD. CORR. METAL PIPE. NON-
PERFORATED, WITH STD COUPLING BANDS,
16 GAUGE.



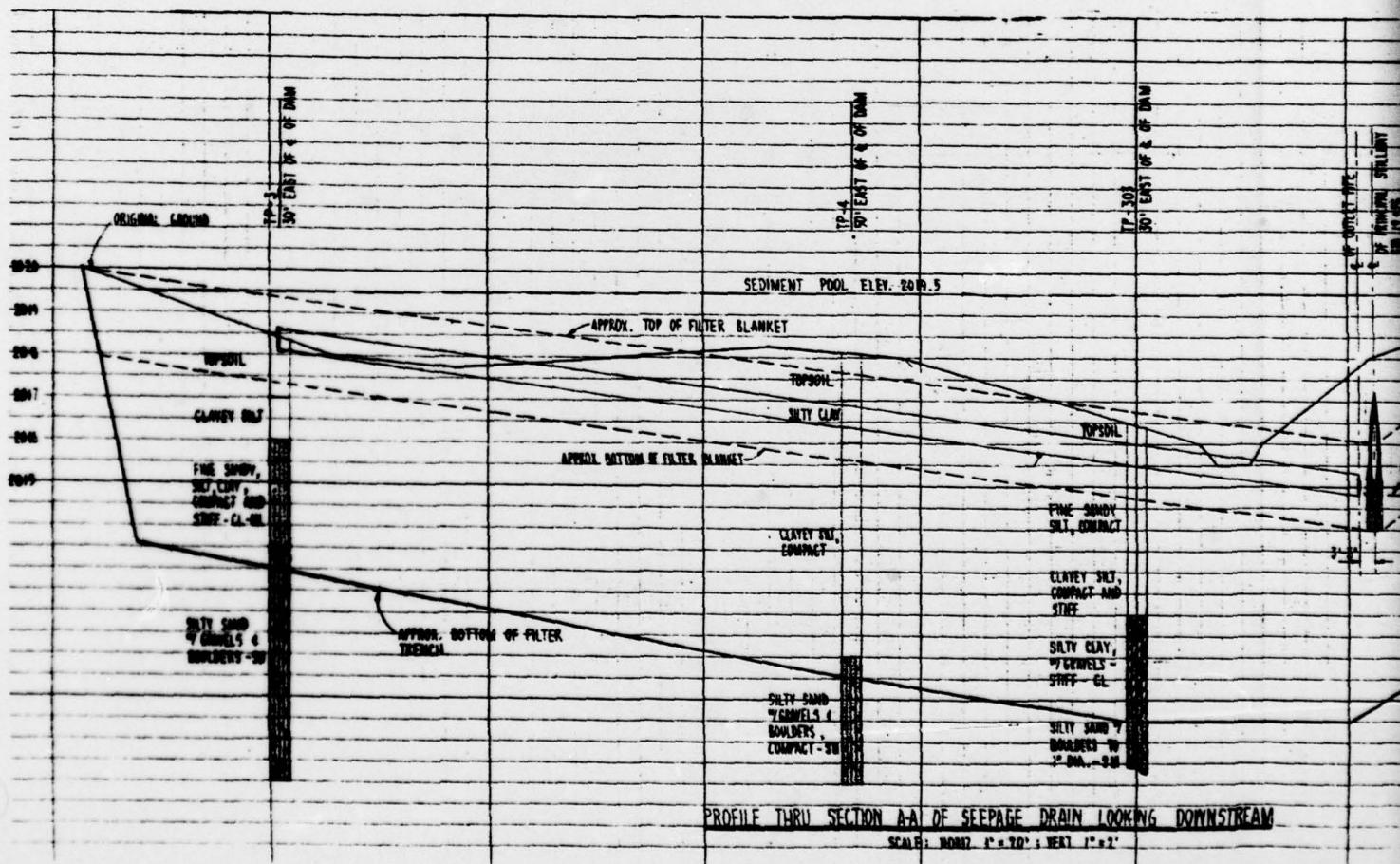
NOTE: FINAL LINE & GRADE OF FILTER
AND DRAIN PIPE TO BE DETERMINED
IN THE FIELD BY THE ENGINEER

PLAN VIEW OF SEEPAGE DRAIN

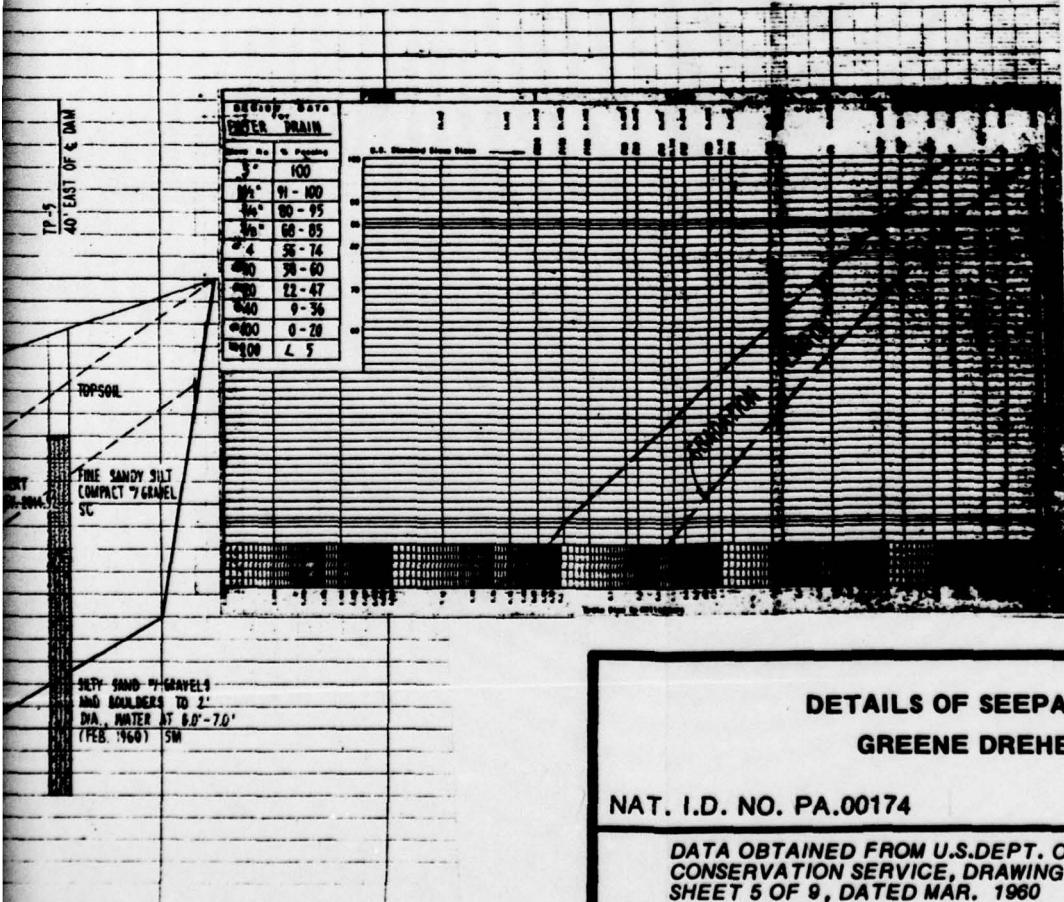
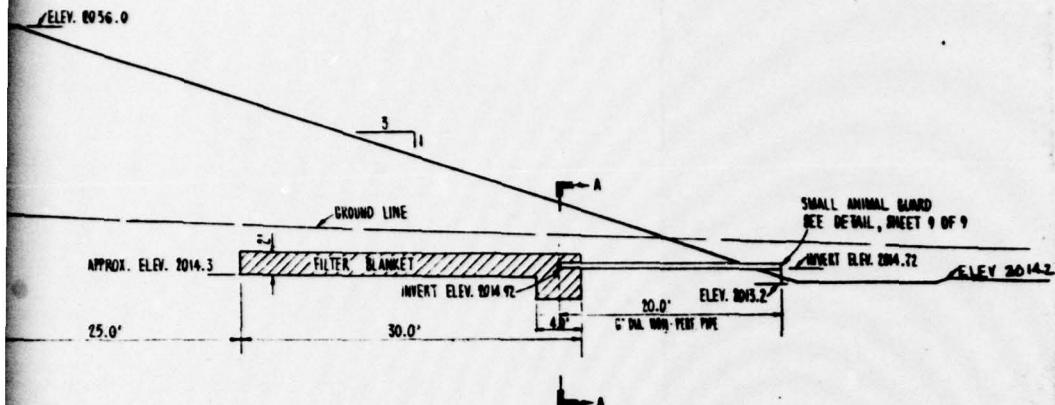
SCALE: 1"-50'

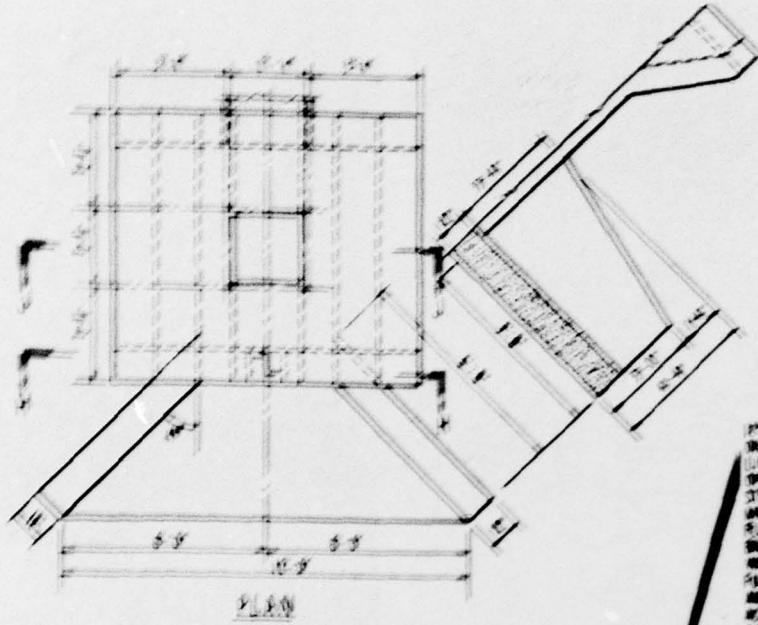


SECTION B-B

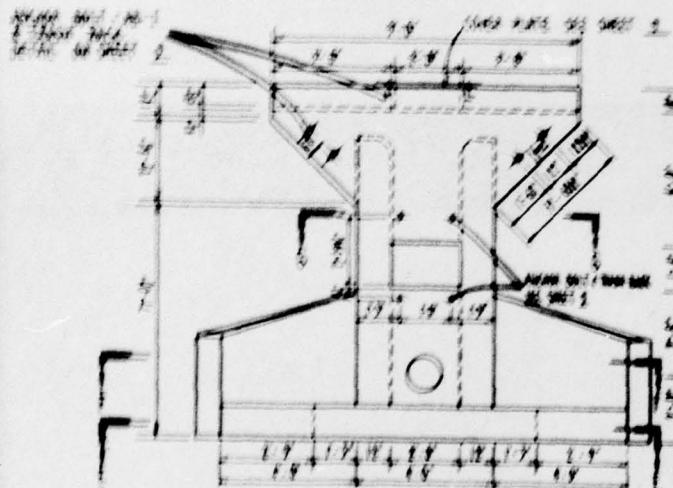


NOTE: EXACT LOCATION OF SEEPAGE DRAIN
TO BE DETERMINED IN THE FIELD BY
THE ENGINEER.

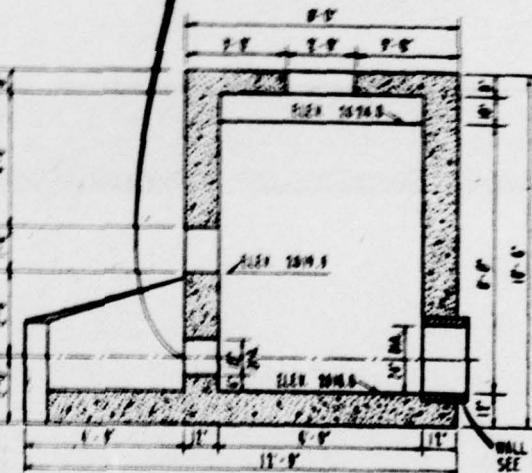




12' SIDE GATE - MARSH MODEL 10-10
 IN SWING POSITION
 10' WIDE X 10' HIGH
 10' SWING LENGTH
 MAX SWING HEIGHT - 10' 6 INCHES
 10' DECK
 SWING SIDE FEATURES A LIFT GATE
 SWING SIDE LIGHT GATE
 SWINGABLE STEP GATES
 SWING GATES WILL BE LOCATED
 ON THE SWINGABLE SIDE OF THE
 CONSTRUCTION



UPSTREAM ELEVATION



SECTION ON CENTERLINE

INTA
GRE
NAT. I.D. NO. PA.00174
DATA OBTAINED FROM CONSERVATION SERV SHEET 7 OF 9, DATED

SE RISER DETAILS
ENE DREHER DAM

WAYNE COUNTY

U.S. DEPT. OF AGRICULTURE, SOIL
CE, DRAWING NO. PA-447 -P,
MAR. 1960

PLATE 6

APPENDIX

F

SITE GEOLOGY
GREENE DREHER DAM

Greene Dreher Dam is located in the Glaciated Low Plateaus Section of the Appalachian Plateaus Physiographic Province. As shown in Plate F-1, the dam site and surrounding area, as is much of northeastern Pennsylvania, is underlain by the Upper Devonian Age Catskill Formation which is overlain by Wisconsin Age glacial drift. Two members of the Catskill Formation have been mapped to the south of the dam site. One is a sandstone belonging to the Duncannon member. The other is a gray sandstone with siltstone interbeds belonging to the Poplar Gap Member on which the dam is located. No rock outcrops were observed in the immediate area of the dam during the field inspection; however, nearby to the south, bedrock reportedly has a near east-west strike and northerly dip. Rock jointing reportedly strikes both north-south and east-west having high angle dips. The seepage characteristics inherent to glacial drift deposits most likely would preclude any concern for seepage related to bedrock structure.

